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Diseases of Cereal and Forage Crops In the United States in 1925

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BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF CEREAL AND FORAGE CROPS IN THE UNITED STATES IN 1925

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CONTENTS

INTRODUCTION

The following summary is the eighth successive annual compilation of diseases of cereal and forage crops to be issued by the Plant Disease Survey. It is based on reports of state collaborators received from practically all states where cereals are important; on reports from members of the Office of Cereal Crops and Diseases and the Office of Vegetable and Forage Diseases; and on information contained in published papers, articles, and news notes that have appeared during the year.

The total number of individual disease records received and used in preparing this summary was 2,632. These were divided among the various sources as follows:

Collaborators	
Annual report cards	1,727
Semi-monthly reports	287
Notes in letters	61
Reports from Offices of the Bureau of Plant Industry	73
Reports from other pathologists	50
Literature references	434
	2,632

These reports were substantiated by 39 specimens.

The quality of information on cereal and forage crop diseases received by the Survey seems to be improving, and the quantity increasing, each year. Pathologists working on these diseases are furnishing notes and specimens more frequently than formerly, and collaborators are doing good work considering the difficulties with which they have to contend. However, there still remains much opportunity for improvement. It is hoped that all who use this summary will keep in mind the fact that the Plant Disease Survey should be supplied with reports from the field concerning plant diseases, and that this information should be sent in as it is accumulated for use in the

Plant Disease Reporter and for recording. All observations, even though they may appear relatively insignificant, are wanted and will be appreciated. In case of the less common or rare diseases, specimens are needed to substantiate the reports.

THE WEATHER OF 1925 AND ITS RELATION TO DISEASES OF CEREAL AND FORAGE CROPS

The weather during the growing season of 1925 was in many respects most unusual, and this in turn was reflected in the occurrence and prevalence of plant diseases. From April throughout the summer until September, the season was unusually dry in practically all states east of the Rocky Mountains. In some states west of the Rockies, however, particularly California, more rains occurred than usual in the summer; also in parts of the spring wheat region the month of June was wet, a fact which had its influence on cereal diseases in those states.

The temperature was above normal in states east of the Rockies, with the exception of the month of May which was generally cool. It may be said, therefore, that in general, with certain exceptions, warm and dry weather prevailed. Tables showing departures from normal temperature and rainfall by states have already been given in Plant Disease Reporter, Supplements 45 and 46, and the reader is referred to these tables for more detailed data.

As an apparent result of these weather conditions, the leaf rusts of cereals occurred in less amounts than usual. The same is true of ergot of cereals and grasses, anthracnose of small grains and grasses, the Septoria diseases of wheat, Diplodia dry rot of corn, wilt and rust of flax, and certain of the leafspot diseases of alfalfa, clover, and other legumes. Except in the spring wheat area and in California, where the rainfall was above normal during June, stem rust of cereals was probably less prevalent than usual. In the areas mentioned, however, it was more than normally prevalent and assumed epidemic proportions. The scab disease of cereals was less common than usual except in the spring wheat area where it was important. In California such diseases as stem rust, foot rot (Helminthosporium) of wheat, glume blotch of wheat, and halo blight of oats were reported to be more abundant than usual. The smut diseases, which are not influenced so much by late spring and early summer weather, but more by conditions during the time of germination, or during flowering time, in the case of loose smuts, did not show much change from normal except in the case of bunt which was more abundant than usual, and of oat smut which was more prevalent in some of the Southern States. In general it may be said that 1925 was an off-year for cereal diseases with the exception of the smuts.

SEED TREATMENT OF CEREALS

Steady advances continue to be made in investigation of materials and methods for seed treatment for cereal diseases, and in their practical application. Copper carbonate dust has come rapidly into general use as a preventive for bunt of wheat and to some extent also for the covered kernel smut of sorghum.

It is being used on oats and other grains but with less satisfactory results. Many investigators are engaged in experimenting with organic mercury, copper, nickel, and other compounds, and combinations of them, for the control of seed-borne diseases of corn and other crops with promising results. Application of organic mercury to the soil for the control of such diseases as brown patch of turf has given more or less satisfactory control.

An important event of the year, as far as the smut diseases of cereals is concerned, is the organization of the "Northwest Grain Smut Prevention Committee" with headquarters at Minneapolis. Represented on this Committee are the state agricultural colleges, the United States Department of Agriculture, business organizations, railroads, and newspapers. This Committee is putting on a grain smut prevention campaign in Minnesota, North and South Dakota, and Montana and as a result of it the losses from smuts, particularly bunt of wheat, should be materially reduced.

References dealing with seed treatment work will be found in this summary under the various disease headings, especially the smut diseases of cereals, and in addition the following articles, dealing for the most part with seed treatment in general, are listed.

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3. Fischer. Die Beizung des Sommergetreides mit Trockenuspulun. (The disinfection of summer cereals with dry uspulun.) Nachr. Landw. Farbenfabr. 4: 53-54. 1925.

4. Friedrichs, G. Beitrag zur biologischen Prufung von Saatbeizmitteln. (Contribution to the biological examination of seed steeps.) Angew. Bot. 7: 1-9. 1925.

5. Kempski. Neue Versuche mit Samendesinfektions- und Samenstimulations- Mitteln. (New experiments with seed disinfectants and seed stimulants.) Nachr. Landw. Abt. Farbenfabr. 4: 43-45. 1925.

6. Kern, H. Erfahrungen mit der Staub-oder Trockenbeize 1922-1924 in Ungarn. (Experiments with the dusting or dry method of seed disinfection in Hungary from 1922 to 1924). Wiener Landw. Zeit. 74: 287-289. 1924.

7. Krauss, J. Nachdosierung von quecksilberhaltigen beizmitteln für getreide. Zeitschr. Angew. Chem. 38: 1088-1091. Nov. 26, 1925.

8. Lindfors, T. Om betningstider vid användandet av 'uspulun'. (Steeping periods in connection with the use of uspulun.) Landtmannen 8: 179-181. 1925.

9. Muller, H. C. and E. Molz. Versuche zur Bekampfung der Saatgutkrankheiten mittels Trockenbeize. (Experiments in the control of seed-borne diseases by dusting.) Deut. Landw. Presse, 52: 11-12. 1925.

10. Nilsson, G. Vilken roll spelar betningstiden vid betning med uspulun? (What part is played by the duration of treatment in disinfection with uspulun?) Landtmannen 8: 237-238. 1925.

11. Pouzin, P. Sur le poudrage des semences. (The dusting of seed.) Jour. Agric. Prat. 89: 89-92. 1925.

12. Puchner, H., and W. E. Fischer. Prüfung eines Beizgerätes der 'Versuchsstation für Pflanzenkrankheiten,' Halle a. S. (Test of a steeping apparatus of the Phytopathological Experiment Station, Halle-an-der-Saalw.) Mit. Verb. Landw. Maschinenprüfungsanst. (Supplement of Tech. Landw.): 5-6. 1925.

13. Riehm, E. Zur Frage der Getreidenbeizung. (The problem of seed steeping.) Zeitschr. Angew. Chemie, 38: 5-6. 1925.

14. Rodenhiser, H. A., and E. C. Stakman. The control of loose smuts of wheat and barley, and barley stripe by uspulun, semesan, and germisan. (Abstract) Phytopath. 15: 51. Jan. 1925.

15. Sampson, Kathleen, and D. W. Davies. Dry treatment of smut diseases of cereals. Welsh Jour. Agric. 1: 169-176. 1925.

16. Stoffert. Ueber Trockenbeize Uspulun. Deut. Obst. u. Gemuseb.-Zeit. 71: 616. Oct. 16, 1925.

17. Throssell, G. L. A simple dry pickler. Jour. Dept. Agr. Western Australia 2: 20-21. 1925.

18. Tisdale, W. H., J. W. Taylor, R. W. Leukel, and M. A. Griffiths. New seed disinfectants for the control of bunt of wheat and the smuts of oats and barley. Phytopath. 15: 651-676. Nov. 1925.

19. Traen, A. E. Forsøk med kemiske midler til bekjaempelse av sot hos korn. (Experiments with chemical preparations for the control of cereal smuts.) Meld. Norges Landbrukshøiskole 2-3: 145-156. 1925.

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DISEASES OF CEREAL CROPS

WHEAT

BUNT CAUSED BY TILLETIA LAEVIS KUEHN AND T. TRITICI (BJERK.) WINT.

Two outstanding facts with regard to the occurrence of bunt in 1925 were, first, the unusual prevalence of the disease in certain parts of the country, especially in the middle Atlantic states and in parts of Kansas and Colorado; and second, the less than usual amount in the Pacific Northwest.

In the past bunt has not usually been considered of much importance in the Eastern United States but last year it was serious in New York and was rated as the most important wheat disease in Pennsylvania, Delaware, Maryland, and Virginia. In Pennsylvania it was more severe than in any other year for which records were kept, in Delaware buyers reported the greatest amount of bunt ever experienced, and in Virginia collaborators reported the highest infection in the history of their ten years' experience in the state. Estimates of losses are to be found in table 74. Concerning its importance in the middle Atlantic States, collaborators have reported as follows:

New York: If this disease is as prevalent in 1926 as it was this year, a campaign of seed treatment will have to be organized. (Chupp)

Pennsylvania: Five times as much this year as last; more severe than any other year for which we have records; mostly in eastern quarter of state, however, it was general over the whole state. (Kirby)

Delaware: Greater prevalence than ever experienced according to buyers; yield losses of 30 to 70 per cent were found in Kent County. (Adams)

Virginia: Much more than last year or the average year, easily the most important wheat disease. Especially in the northern and southern parts of the state.

Our data on smut losses is mostly from millers' reports rather than from field surveys. A brief synopsis of a few of these reports follows:

Edinburg - 70 per cent of crops affected, 25 per cent unfit for milling.
Albemarle County - 10 per cent of wheat unfit for milling.
Campbell County - practically all crops affected.
Rockingham County - refused to buy a number of crops.
Alexandria - lots of smut in almost every lot.
Chase City - more than ever before.
Richmond - hardly a sample that does not show smut.
Wythe County - 50 per cent affected, some unfit for milling. (Fromme)

The states of Kansas, Montana, Colorado, Utah, and California reported more than last year and more than normal, and in the spring wheat states, Minnesota and the Dakotas, the wheat was found to be unusually smutty as threshing and marketing progressed. In Kansas, where the loss was estimated at from $7,000,000 to $8,000,000, it was worst in the northwestern counties, less severe in central Kansas, and practically negligible in eastern Kansas; in Colorado it was general but most important in the eastern part of the state; in California it was worst in the Montezuma Hills region.

The reduction in amount of bunt in the Northwest, including Idaho, Washington, and Oregon, is attributed to the very heavy killing of fall-seeded wheat by low temperatures and the resulting preponderance of spring wheat which seemed to be only slightly infected. Regarding this situation collaborators of Washington and Oregon report as follows:

Washington: Because of very heavy winter killing of fall seeded grain there is an unusual acreage of spring wheat. The amount of smut is, therefore, lower than it has been in some years since there is very little smut in spring wheat. (Dept. Plant Path.)

Oregon: Extremely cold weather in December following two weeks of exceptionally warm weather for winter froze out most of the winter wheat, and caused reseeding of 90 per cent of the acreage in eastern Oregon. Hybrid 128 and Jenkins Club, winter wheat varieties ordinarily grown, are very susceptible to bunt, and the loss averages usually about 5 per cent in both. Varieties replanted this year were Federation, Hard Federation, and Marquis, all resistant to bunt. At least 30 or 40 per cent of the fields had no bunt in them, and in those that did there was not more than 1 per cent. Besides this, soil contamination is not a factor in infection of spring grain. The little winter wheat left had all the weaker plants, including bunt-affected plants, frozen out, so that there was less bunt than usual even in the winter wheat, and the unusual preponderance of spring wheat made the percentage in the total crop much less. (Barss)

Table 74. Estimated percentage field loss from bunt according to collaborators, 1925.

State	Average percentage loss	Maximum percentage in any field	State	Average percentage loss	Maximum percentage in any field
New York	1.2	-	Iowa	Trace	-
New Jersey	Trace	-	North Dakota	2	55
Pennsylvania	3	-	South Dakota	2	-
Delaware	4	70	Kansas	6	80
Maryland	2	-	Kentucky	Trace	-
Virginia	4	-	Arkansas	3	20
West Virginia	Trace	-	Montana	3	50
North Carolina	1	-	Colorado	15	75
Ohio	1	25	Arizona	5	15
Indiana	Trace	-	Utah	1	-
Illinois	Trace	10	Idaho	3	-
Michigan	1	-	Oregon	0.5	-
Minnesota	0.2	15	California	1	25

Weather relations:

It is generally recognized that soil and weather conditions during the time of germination are very important in influencing bunt infection, therefore, an inquiry into the environmental conditions that prevailed in the fall of 1924 in the Middle Atlantic States and their relation to the epiphytotic of bunt may be of value.

Soil temperature at the time of germination is important. Woolman and Humphrey (U. S. Dept. Agr. Bul. 1239: 1-29, 1924) at Pullman, Washington found that mean soil temperatures of from 40.8° to 62°F. gave over 90 per cent Tilletia tritici. Hungerford (Phytopath. 12: 337-352. 1922), in Idaho, found that the optimum temperature for infection with the same fungus was from 48° to 54°F. It would seem, therefore, that comparatively low temperatures are favorable for Tilletia tritici. Probably the same statement holds for Tilletia laevis, although not so much work has been done regarding the temperature relations of that fungus.

Weekly telegraphic summaries in the Weather and Crop Bulletin of the United States Department of Agriculture show that in Pennsylvania the period of wheat seeding in the fall of 1924 began about the middle of September and ended about October 1924. The period of maximum germination would seem to be during the first two weeks of October. In Virginia sowing began somewhat later and apparently extended from about October 1 to November 7 with maximum germination probably occurring during the two weeks ending October 14 and 21. An examination of the temperatures during these periods shows that the air temperatures were much lower than normal. The soil, therefore, must have been abnormally cold. In table 75 are shown the weekly temperatures and departures from normal for the period of wheat seeding at three stations in Pennsylvania and three stations in Virginia.

Table 75. Average weekly temperatures and departures from normal Sept. 16 - Oct. 21, 1924, at three Pennsylvania and three Virginia stations.

Station	Sept. 16		Sept. 23		Sept. 30		Oct. 7		Oct. 14		Oct. 21	
	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.
Scranton	°58	-6	°62	0	°58	-1	°56	0	°52	-2	°52	+1
Harrisburg	62	-5	62	-3	58	-4	60	+1	56	-1	58	+4
Philadelphia	64	-5	64	-3	64	-1	62	0	60	0	58	+1
Richmond	66	-6	66	-3	64	-3	62	-2	58	-4	62	+3
Lynchburg	64	-6	64	-4	60	-5	60	-3	58	-2	64	+6
Wytheville	60	-4	62	0	56	-4	54	-4	58	+3	60	+7

It will be seen that the week ending October 21 is the only one in which temperatures were above normal. The statement is made, in the reports of the Weather Bureau, that in Pennsylvania September 1924 was the coldest September in the history of the weather service with the exception of the years 1868 and 1917; and in Virginia also it is stated that unusually cold weather occurred during that month. The month of October was below normal in Virginia and only slightly above normal in Pennsylvania, with respect to temperatures.

The precipitation or amount of soil moisture must also be considered in this connection and so table 76 giving the rainfall and departures from normal for the same six Pennsylvania and Virginia stations has been prepared.

Table 76. Average weekly precipitation and departures from normal for weeks ending Sept. 16 to Oct. 21 inclusive, for six stations in Pennsylvania and Virginia.

Station	Sept. 16		Sept. 23		Sept. 30		Oct. 7		Oct. 14		Oct. 21	
	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.	Av.	Dep. from norm.
Scranton	0.7	-0.2	0.3	-0.3	3.7	+3.2	1.7	+1.1	0.1	-0.7	T	-0.7
Harrisburg	0.2	-0.7	0.4	-0.2	3.5	+2.9	0.6	0	T	-0.8	0	-0.7
Philadelphia	1.1	0	1.0	0	1.2	+0.6	1.3	+0.6	0.1	-0.6	0	-0.7
Richmond	1.1	+0.1	2.5	+1.7	4.1	+3.4	0.9	+0.3	0	-0.5	T	-0.8
Lynchburg	T	-0.1	1.5	+0.6	2.5	+1.7	T	-0.9	0	-0.6	0	-0.7
Wytheville	T	-0.8	2.0	+1.2	3.4	+2.6	0.1	-0.6	0	-0.6	0	-0.7

In general, it was comparatively dry during the period of wheat germination. The September rainfall in Pennsylvania was considerably above the normal, but this excess was due to heavy rains, including more than half of the precipitation for the month, which occurred on the last few days. There was an abundance of rain in Virginia during that month. October, however, was very dry in both of these states. From the work of Hungerford and of Woolman and Humphrey, cited above, it seems that a moist, but not very wet, soil is favorable for germination and infection by the bunt organism. According to the weather records cited it would appear that during seeding time the soil was probably not over-wet but, if anything, rather dry. Of the two factors, temperature and moisture, that have a bearing on the percentage of bunt it would seem that temperature was probably the more important last year and that it was largely the cool weather preceding, during, and subsequent to seeding that brought about the great increase in the amount of the disease.

Varietal susceptibility:

Concerning varietal susceptibility collaborators in Michigan report Berkeley Rock highly resistant, while those in Minnesota and North Dakota mention Kota and Prelude as very susceptible, with Marquis resistant. Only a trace of bunt was noted on Marquis in Colorado, while in most of the winter wheats the loss averaged about 15 per cent. It will be noted that in the report, quoted above, for Oregon, the winter wheats, Hybrid 128 and Jenkins Club, are said to be very susceptible, while the spring wheats, Federation, Hard Federation, and Marquis, are mentioned as resistant.

In an extensive series of experiments conducted in the Pacific Coast States, extending over two years, Tisdale, Martin, and others (21) have determined the relative resistance to bunt of the commercial wheats of the United States. Of four commercial classes of common wheat, the hard red winter wheats were found to be most resistant while the white wheats were as a class most susceptible. The hard red spring and soft red winter varieties were somewhat intermediate in susceptibility, although one of the soft red winter varieties

proved highly resistant. The club wheats as a rule were the most susceptible to bunt. The varieties and strains found to be immune or highly resistant are enumerated. Among them are two varieties, Hussar and Martin, which proved to be immune. The probable value of these wheats for further hybridization work and for commercial planting is indicated.

Control:

In connection with the report on cereal diseases, collaborators were asked to what extent the copper carbonate method of seed treatment was being used, and to estimate the amount copper carbonate employed. The replies to these questions follow. It will be noted that the copper carbonate treatment is the principal one used in all states where the disease is at all serious and that rapid progress has been made in introducing it.

Connecticut: Not used at all. (Clinton)

New York: None used or at least only in a very few cases. (Chupp)

Pennsylvania: Previous to 1924 little or no wheat was treated in Pennsylvania for bunt control. In 1924 I put on four demonstrations on bunt control with copper carbonate dust. As a result something over 1000 bushels of wheat was treated.

In 1925 I attempted to put on a real drive to have wheat treated with copper carbonate dust. However, realizing that the success of the treatment depended on having every kernel of wheat covered with the dust the first drive was to have proper machines built in which to do the treating. The thirty-gallon diagonal-axle barrel was the one that was recommended. About 50 of these were constructed according to our specifications by farm bureaus, grain dealers, millers, and farmers, and practically all the wheat was treated in these machines this year. In addition, one large commercial treating machine was brought into the state. Approximately two tons of high grade copper carbonate dust was brought into the state this year for use in bunt control. Through our records and those of the county agents we know that at least 32,000 bushels of wheat was treated for bunt control with high grade copper carbonate dust. In addition to the above some 200 bushels of wheat were treated with formaldehyde, 100 bushels with uspulun soak treatment and 20 bushels with colloidal copper dust. (Kirby)

Delaware: The general heavy infection favored interest in control and 8 demonstrations were held. The loss in yield and dockage experienced by growers established general interest, especially in the control by dust disinfectants.

The use of copper carbonate introduced along with other dust disinfectants for the first time. Orders for 2000 pounds of copper carbonate are known, and probably 2500 pounds were used in the state. (Adams)

Maryland: About 5000 bushels were treated in 1925. (Jehle)

Virginia: Copper carbonate is being used extensively this year in practically all parts of the state. We have carried on an extension campaign which has met with exceptional success. There has been a great need as bunt has been more prevalent than in any other year of my ten years' experience in the state. Our latest records show that 10,000 pounds of copper carbonate were used for treatment of wheat. We believe that this figure could have been doubled if copper carbonate had been available to supply the demands. (Fromme)

West Virginia: Copper carbonate not used. (Giddings)

Kentucky: Copper carbonate probably used only to a very slight extent as we have no extension service in plant pathology. (Valleau)

North Carolina: With regard to the control of bunt of wheat, copper carbonate dust was used to some extent this year, this being the first season when there was any demand for the chemical. Approximately 30 pounds are known to have been used, which amount probably includes all that was applied. Bunt has not been of any severity in the wheat crop during the past two seasons. Still a good many of the wheat growers are in the habit of soaking their grain in bluestone or formaldehyde before planting. It is likely that the new dry method will replace the old wet ones. (Fant)

Louisiana: None used. (Edgerton)

Arkansas: No information. (Rosen)

Ohio: Probably about 30,000 pounds of copper carbonate used. (Thomas)

Indiana: Copper carbonate treatment well known and extensively used About 6,000 bushels were treated in 1925. (Gregory)

Illinois: Up to the present time, copper carbonate is being used to but a slight extent for treating bunt. In the St. Louis area it has been used to considerable extent for treating flag smut, but I understand also that it is not being done as much as in the past when the treatment was more or less compulsory. This treatment for bunt seems to be effective, but is not being used very much because (a) it has not been given much publicity, (b) very few farmers or farm bureaus have mixing machines for applying it, and (c) many who have used it do not like it very well because of the irritating properties of the dust. (Tehon)

Wisconsin: Do not know of any used. (Vaughan)

Iowa: Very little of this material needed. We know of five farmers who treated their seed with absolute control. (Dept. Plant Path.)

North Dakota: Not generally used. Has not replaced formaldehyde. Probably about two tons used. (Brentzel)

Nebraska: Eleven counties where demonstrational work was carried on used 5,000 pounds of copper carbonate. (Peltier)

Kansas: Seed for about 300,000 acres treated with copper carbonate this year. (Melchers)

Colorado: Copper carbonate not used until this year. The following campaign demonstrated that amounts of copper carbonate in stock in the various chemical concerns was used up and that these imported several additional carloads which were sold. (Durrell)

Arizona: Graham County reports copper carbonate seed treatment as satisfactory. (Streets)

Idaho: In the Palouse region of northern Idaho copper carbonate has become rather popular. About one-fourth of the wheat seeded in this region was thus treated. (Hungerford)

Oregon: Eighty per cent of the wheat acreage treated with copper carbonate, probably 112,000 pounds of copper carbonate were used. (Jackman & Barss)

California: Universally used. (Mackie)

Recent literature on bunt and its control:

Other references dealing with seed treatment of cereals in general will be found on page 304.

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17. Quodling, H. C. Pickling wheat with carbonate of copper. Queensland Agr. Jour. 23: 456-457. Nov. 1925.

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20. Thomas, R. C. Control of smuts of wheat and oats with special reference to dust treatments. Ohio Agr. Exp. Sta. Bul. 390: 405-423. Dec. 1925.

21. Tisdale, W. H., J. H. Martin, et al. Relative resistance of wheat to bunt in the Pacific Coast States. U. S. Dept. Agr. Bul. 1299: 1-30. 1925.

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) ROSTR.

Only three states, Pennsylvania, Minnesota, and Nebraska, reported more than the usual amount of loose smut. The majority of the other states reported it as less than or about as usual. Practically all other states mentioned it as being generally distributed, but in Indiana and Illinois it was mostly reported from the central counties, and in Idaho it was said to be important in spring wheat under irrigation. In the Pacific Coast States the disease was of no importance except in the case of a few unimportant varieties. H. P. Barss reports that,

> "It has a tendency to die out under Oregon conditions. In Morrow County it occurred only in Marquis wheat from Montana seed."

W. W. Mackie stated that,

> "Loose smut is so rare in California that only an expert can find it. This year was no exception."

The maximum amounts found in individual fields were reported as follows: 25 per cent Utah; 20 per cent Minnesota, Ohio; 17 per cent Pennsylvania; 14 per cent Virginia; 10 per cent West Virginia and Arkansas; 7 per cent Michigan; 6 per cent Arizona; and 3 per cent Kansas.

The estimated average loss by states as given are shown in table 77.

Table 77. Estimated percentage loss from loose smut of wheat, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
4	Arkansas	1.5	New York, Ohio,
3.4	Virginia		Nebraska, Utah, Idaho
3	Maryland	1	New Jersey, South
2.5	Michigan		Carolina, Indiana,
2.1	Pennsylvania		Minnesota, Missouri
2.	Connecticut, West	0.5	Delaware, Illinois,
	Virginia, North Caro-		Arizona
	lina, Georgia, North	0.25	Kansas
	Dakota, South Dakota,		
	Kentucky		

In a paper on susceptibility of wheat varieties and selections to loose smut presented at the Kansas City Meeting in December, F. D. Fromme (4) reported that inoculations of the florets of the varieties Stoner and Leap produced 62 per cent infected plants of Stoner and only 3 per cent infected plants of Leap. Within the variety Fulcaster various races were found, some of which were very susceptible to loose smut, others moderately so, and some highly resistant. The probability of developing a highly resistant strain of Fulcaster through pure line selections is indicated.

Reports of collaborators on varietal susceptibility follow:

Pennsylvania: Leap most resistant variety, Forward is showing more susceptibility than heretofore. Pennsylvania 44 and Red Rock are the most susceptible. (Kirby)

Kentucky: On the Experiment Station Farm Currells Prolific, which has usually had about 5 or 6 per cent, was practically free while Michigan Amber grown next to it for the last two years had the usual 5 or 6 per cent. (Valleau)

Indiana: Trumbull wheat is apparently immune. (Gregory)

Minnesota: Prelude and Kota very susceptible. The usual amount appeared in Marquis and the amount in Kota seems to be increasing, an average field containing about 10 per cent. (Sect. Plant Path.)

North Dakota: Kota and Monad very susceptible. (Brentzel)

Kansas: Hard varieties of wheat always have the least amount of loose smut. (Melchers)

Recent literature:

1. Anon. Die elektrische Heisswasserbeize, eine neue Möglichkeit zur Bekämpfung der Blüteninfektionen. (The electrical hot water steeping apparatus, a new possibility for the control of blossom infections.) Tech. Landw. 6: 47. 1925.

2. Conners, I. L. Organic mercury compounds for the control of loose smuts of wheat and barley and barley stripe. (Abstract) Phytopath. 16: 63-64. Jan. 1926.

3. Elkar, H. Die Anwendung des Appel'schen Heisswasserbeizapparates gegen Flugbrand auf Grund 4jähriger Erfahrungen im praktischen landw. Betriebe. Pflanzenbau. 1924/25: 258-259. Feb. 1, 1925.

4. Fromme, F. D. Susceptibility of wheat varieties and selections to loose smut. (Abstract) Phytopath. 16: 86-87. Jan. 1926.

5. Neill, J. C. Loose smut of wheat. II. Field experiments on seed disinfection by hot water. New Zealand Jour. Agr. 30: 167-174. March 1925.

6. ---------- Loose smut of wheat. III. A comparison in germination and percentage infection between "firsts" and "seconds" seed. New Zealand Jour. Agr. 31: 161-163. Sept. 1925.

7. Tapke, V. F. Single-bath hot-water and steam treatments of seed wheat for the control of loose smut. U. S. Dept. Agr. Bul. 1383: 1-28. March 1926.

FLAG SMUT CAUSED BY UROCYSTIS TRITICI KOERN.

In the United States flag smut is known to occur only in the three states of Illinois, Missouri, and Kansas. The following reports concerning the situation in those states have been received:

Illinois: Inspections were made in 31 counties during May and June in which a total of 3,470 fields were inspected and a total of 45 fields were found infested. A complete survey was not attempted in the generally infested areas in Madison and St. Clair Counties. A complete survey of these counties would, no doubt, have run the number of infested fields up to three or four hundred. The infestation a year ago was very light, due, no doubt, to the severe winter of 1923-24 which resulted in heavy winter killing of wheat. The degree of infestation this year was somewhat heavier than last year, indicating that the disease is again on the increase.

No flag smut was found in Greene, Jersey, and Washington Counties this year. Last year 4 infested fields were found in Greene County, 1 in Jersey County, and 1 in Washington County. Year before last 13 infestations were found in Jersey County. The apparent eradication of the disease in this county is due, no doubt, to unfavorable climatic conditions and especially to the last two cold winters.

In the northern part of Monroe County, in which a number of infested fields were found two years ago, one infested field was found this year. About the same number of infested fields were found in Logan County this year as last. There is a small Canadian Hybrid which is susceptible to the disease. We have not been able to get growers to change to the resistant varieties.

In Madison County, out of an inspection of 268 fields, 25 fields were found infested, all limited to the old infested area. In St. Clair County there was a total of 303 fields inspected. Ten of these fields were found infested inside of the old infested area. One infested field was found outside of the old area toward the northeastern part of the county. The infestation in all but about four or five fields was very light, requiring considerable search in order to find it. In one field in St. Clair County, which was so badly infested the first year, the infestation ran about 25 per cent in Fultz wheat this year. One or two other fields in the wooded area of St. Clair County had an infestation of 1 per cent or more. There was only one field found in Madison County which would run 1 per cent or more, one in Scott County, and one in Logan County.

As a result of the six year observations made in flag smut work, I am of the opinion that it will not prove to be a very serious disease in Illinois, but it may occasionally cause considerable loss in isolated fields on farms on which rotation has not been practiced and resistant varieties of wheat have not been sown. (P. A. Glenn)

Missouri: Our men were not able to do any scouting work for flag smut. We have likewise received no inquiries or complaints from county agents or farmers, even in the previously known infested areas. (Leonard Haseman)

Kansas: A survey of Leavenworth County, where this disease has been the most common in other years, showed that in 1925 less flag smut was present. The fields where it occurred showed from a trace to 5 per cent. In one or two instances parts of fields had 15 to 20 per cent but the average for the fields would not run over 5 per cent. This smut cannot be said to be spreading at an alarming rate, in fact it seems less prevalent than 3 years ago. (Melchers)

Recent literature:

1. Carne, W. M. Cereal smuts. Jour. Dept. Agr. Western Australia II. 2: 10-19. March 1925.
An observation concerning flag smut during the past three or four years is the apparent resistance of Nabawa. The resistance of Florence and Yandilla King is also indicated.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

More or less stem rust occurred widely and scatteringly over the country but it was only in the spring wheat states, especially Minnesota, North Dakota, and South Dakota, and also in California, as well as in certain localized areas in some of the winter wheat states, that it occurred in sufficient abundance to do much damage. In their reports to the Plant Disease Survey; quoted below, several collaborators have given information of general interest concerning local distribution of the rust within their states.

Pennsylvania: Generally distributed but severe injury confined to areas in the southeast near barberries. (Kirby)

Virginia: Occurred in southwestern Virginia in the area where Berberis canadensis occurs. (Fromme)

North Carolina: Specimens were received from Madison County, which is located in the mountains, and similar specimens have been received from this general section during the past years. Stem rust apparently does not occur in the rather extensive wheat section in the Piedmont area but is confined to the higher altitudes of the mountains. (Fant)

Indiana: A mere trace found in places indicated on the map (six counties in southern Indiana). (W. E. Leer)

Illinois: General throughout state but heaviest on winter wheat in southeast and on spring wheat in extreme north. (Tehon)

Michigan: In southern part of the state there was a very small amount of rust but in the northern part some fields were a complete loss. In the northern part of the lower peninsula where barberries have not been removed local epidemics were found which completely destroyed certain fields. (Nelson)

Wisconsin: Statewide, mostly in the vicinity of wild barberries. The southeastern areas had very little rust. (Vaughan)

Minnesota: General but not severe in west central portion of the state. (Sect. Plant Path.)

North Dakota: From maps furnished by G. C. Mayoue and D. G. Fletcher it appears that the greatest damage occurred to bread wheat in the eastern part of the state in the Red River Valley.

South Dakota: For the western half of the state the yield and quality of wheat were high while losses due to stem rust were sporadic and slight. The eastern half of the state, however, had a considerable loss which in some areas has been estimated to be as high as 15 per cent for some varieties. ***** The central part of this area was the hardest hit and an arm-like area extending to the northern limit of the state suffered considerable loss. To the southward the loss was less marked. (E. J. Petry)

Certain areas in the state, especially in the vicinity of Mitchell, Huron, and Redfield showed the heaviest stem rust infection; other portions of the state, especially those in western South Dakota in which crops were splendid this year, showed no noticeable rust infection. (R. O. Bulger)

Nebraska: Amounts ranging from a trace of rust in the east to 1 per cent on spring wheat in the west. (Peltier)

Kansas: Most fields in the state did not even show a trace. Only in rare instances did we find a field where 0.5 to 1 per cent occurred. Even up in northwest Kansas where stem rust usually occurs when it appears in Kansas at all, practically none was present, at least not in amounts to cause an appreciable injury. (Melchers)

Texas: Occurred practically all over the state. Severity was slight, so, although prevalence was considerable, there was little or no shriveling of grain. (Wallace Butler)

Wyoming: Spring wheat in Crooks County showed a loss of 5 to 10 per cent in the eastern half; for the whole county the rust loss was about 2 per cent. Spring wheat in Fremont County showed a rust loss of about 5 per cent; elsewhere in the state there was no loss from rust in spring wheat. (R. U. Cotter)

Colorado: A general sprinkling of rust entered eastern Colorado the latter part of June but did not develop sufficiently to do any damage. (Lungren)

Idaho: Some damage in irrigated section. (Hungerford)

California: Appeared sporadically in a number of areas but was worst in the northern Sacramento Valley. (Mackie)

Concerning prevalence as compared with other years, collaborators in the spring wheat area - North Dakota, South Dakota, and Minnesota, and in Wisconsin, Utah, and California, reported more than the average and more than last year. In the spring wheat area, the disease was epidemic. The outbreak, however, was not so extensive nor so severe as that in 1923. A comparison of the estimates of losses for the two years shows that in 1923 they were greater in the spring wheat area and also in other states, particularly Montana and Colorado. The average loss for the United States in 1923 was estimated at 4.07, whereas in 1925 it will probably not exceed 2 per cent.

The relation of barberries to stem rust in Virginia and data on losses in individual fields is reported by F. D. Fromme as follows:

"A trip to the Jackson's Ferry and Foster Falls section of Wythe County, Va., was made on June 24, 1924, and a study was made of the relation between the occurrence of barberries and stem rust of wheat. Severe infection of stem rust was found in these localities and also at points along the Lee Highway between Wytheville and Pulaski. The injury was strikingly correlated with the presence of barberries in all cases, and comparative freedom from injury was always associated with the absence of barberries.

"Representative samples of wheat, all of the Fulcaster type, were obtained from a number of fields, and these were made up into bundles of uniform size for purposes of comparison. Comparative yields were obtained by threshing 20 heads from each sample and weighing the grain obtained.

"***A comparison of the average yield, as well as the individual yields, in the severely infected fields with the yields of the slightly infected and clean fields shows in a very striking way the injury from stem rust. The severely infected fields show an average of only 3.98 grams of grain in 20 heads as compared with 15.75 in the slightly infected fields and 18.4 in the field with no infection. The percentage reduction in the slightly infected fields is 14.4 while that in the severely infected fields is 78.4. The one moderately infected field shows a yield of 11.7 grams and a percentage reduction of 36.4.

"A number of oat fields in close proximity to the wheat fields and to barberries were examined but only slight infection of stem rust was found. Rye was practically free from infection, a trace only being seen. Considerable stem rust was found on two grasses which are common in the section, orchard grass, Dactylis glomerata, and cheat, Bromus secalinus."

Table 78. Estimated reduction in yield due to stem rust in 1925.

Percentage loss	States reporting	Percentage loss	States reporting
11	Minnesota	Trace	Maine, New York, Maryland,
7.5	South Dakota		West Virginia, Indiana,
5	North Dakota, California		Illinois, Nebraska,
3.5	Wisconsin		Kansas, Louisiana,
1	Utah, Idaho		Texas, Arkansas,
0.5	North Carolina, Michigan		Montana, Wyoming,
0.3	Virginia		Colorado, Arizona,
0.25	Connecticut		Washington, Oregon
0.2	Pennsylvania		
0.1	Ohio, Iowa, Kentucky		

Tables giving the dates of earliest appearance of rust both on barberry and on cereals and grasses have already been given in the Plant Disease Reporter (Vol. 9: 18-19, July 1, 1925). Certain other data have been received since that time, however, and the accompanying table 79 showing dates and places of earliest observations of stem rust on wheat in various states is given.

Table 79. Dates of first appearance of stem rust on wheat, 1925.

Date	State	Place	Date	State	Place
May 1	Arizona	Maricopa Co.	June 12-13	Kansas	Republic Co.
May 7	Texas	Brazos Co.	June 15	Minnesota	Kitson Co.
June 4	Illinois	Jersey Co.	June 20	Michigan	Wexford Co.
June 8	Nebraska	Richardson Co.	June 23	Colorado	Kit Carson Co.
June 10	Ohio	Prebel Co.	June 25	Indiana	Martin Co.
June 11	Pennsylvania	Cumberland Co.			

During the year, the barberry eradication campaign continued in the same thirteen states. A complete report of this work for 1925, prepared by F. E. Kempton, has appeared in the Cereal Courier (17: 415-443, December 31, 1925). In this the following summarized statement is made regarding survey and eradication work.

> "During the calendar year 1925, approximately 57 counties were covered in original survey and approximately 56 counties were surveyed a second time. In continuing the resurvey, about 160 counties were covered. Original bushes numbering 142,550 were found on 3,985 properties, and 149,822 bushes were destroyed on 4,119 properties. These totals include 55,485 bushes found on 1,092 properties in second survey. In resurvey, 17,036 sprouting bushes were found and 17,141 were eradicated. Seedlings numbering 701,796 were found in original survey, second survey, and resurvey."

At the Kansas City meeting, three papers dealing with control of cereal rusts by sulfur dust were given (1,11,12). All of the authors seem to agree that it was possible to control rusts by dusts with sulfur if enough applications were made, but from results presented so far the practicability of this method is yet to be demonstrated. Three applications of sulfur per week were needed to control stem rust in Manitoba, according to Bailey and Greaney (1), In Minnesota in some experiments one application seemed to control, while in others as many as five applications were practically ineffective, and Lambert and Stakman (12) report that in years of severe epidemics in the hard spring wheat area it would be necessary to begin dusting when the grain is in flower or earlier and continue until the hard-dough stage, thus necessitating 5 or 6 applications. Kightlinger and Whetzel (11) increased the yield of wheat by 18.5 per cent by making applications of sulfur dust. The rust controlled in their experiments, however, was leaf rust rather than stem rust.

Recent literature:

1. Bailey, D. L., and F. J. Greaney. Preliminary experiments on the control of leaf and stem rusts of wheat by sulfur dust. Phytopath. 16: 64. Jan. 1926.

2. ---------- Preliminary experiments on the control of leaf and stem rusts of wheat by sulphur dust. Scient. Agr. 6: 113-117. Dec. 1925.

3. Desprez, F. Observations sur la rouille. (Observations on rusts.) Jour. d'Agr. Prat. 89: 118-120. 1925.

4. Harrington, J. B. The inheritance of resistance to Puccinia graminis in crosses between varieties of durum wheat. Scient. Agr. 5: 265-288. 1925.

5. Hayes, H. K., E. C. Stakman, and O. S. Aamodt. Inheritance in wheat of resistance to black stem rust. Phytopath. 15: 371-387. 1925.

6. Jackson, V. W., W. P. Fraser, and D. L. Bailey. The present status of the barberry eradication campaign in western Canada. Scient. Agr. 5: 375-378. Aug. 1925.

7. Kempton, F. E. Barberry eradication as a method of reducing stem rust losses of small grains. Rept. Proc. Tenth Ann. Blister Rust Conf., Washington, D. C., Feb. 18-23, 1925: 35-60. 1925.

8. ---------- G. C. Curran, and E. D. Griffin. Barberry eradication in Illinois. Trans. Illinois State Acad. Sci. 16 (1923): 198-209. 1923.

9. ---------- and N. F. Thompson. The common barberry and how to kill it. U. S. Dept. Agr. Circ. 356: 1-4. July 1925.

10. Kent, J. K. Eradicating common barberry in Iowa. Iowa Agr. 25: 225-226. Feb. 1925.

11. Kightlinger, C. V. and H. H. Whetzel. Second report on dusting for cereal rusts. Phytopath. 16: 64. Jan. 1926.

12. Lambert, E. B., and E. C. Stakman. Effect of sulfur dust on the development of black stem rust of wheat in a natural epidemic. (Abstract) Phytopath. 16: 64-65. Jan. 1926.

13. Schmidt, D. Eradication of common barberry is best black rust prevention. Seed World 17 (3): 9. Jan. 30, 1925.

14. Schulz, E. R., and N. F. Thompson. Some effects of sodium arsenite when used to kill the common barberry. U. S. Dept. Agr. Bul. 1316: 1-18. 1925.

15. Stakman, E. C., M. N. Levine, and F. Griffee. Webster, a common wheat resistant to black stem rust. Phytopath. 15: 691-698. Nov. 1925.

16. Thompson, Walter P. Cytological conditions in wheat in relation to the rust problem. Scient. Agr. 5: 237-239. April 1925.

17. Walker, W. A., and N. F. Thompson. Black stem rust and the progress of barberry eradication in Wisconsin. Bul. Dept. Agr. Wisconsin 68: 1-24. May 1925.

LEAF RUST CAUSED BY PUCCINIA TRITICINA ERIKS.

Leaf rust was of much less importance last year than usual. The only states indicating more prevalence of rust were Wisconsin, North Dakota, Colorado, Utah, Oregon, and California. Collaborators in other states, especially those in the East, reported much less than the average.

Table 80. Estimated percentage losses from leaf rust, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
5	Iowa, North Carolina	0.5	Arizona, Texas
1.5	New York, Illinois	0.3	Pennsylvania
1	Wisconsin, Tennessee, California	0.25	Connecticut
		0.1	Ohio, Kentucky

Several collaborators mention the fact that the disease appeared very late in the season with the result that only slight damage occurred. They also state that the dry spring probably was responsible for holding the disease in check. In Indiana, E. B. Mains reported that apparently the amount of overwintering material was greatly reduced in February and the dry spring delayed development. A glance at the table showing departures from normal precipitation (Plant Disease Reporter, Suppl. 45: I, 1926) will show that the months of April, May, and June were unusually dry, especially in the eastern part of the country. During the month of May the precipitation

was below normal for all wheat states except Oregon and California and it so happens that these are two of the states that mention leaf rust as being more prevalent than the average year. Prolonged spring rains are thought to be responsible, according to H. P. Barss of Oregon.

Dates of earliest appearance:

Jan. 1	Tarrant County	Texas
Feb.	Clark County	Georgia
April		California
May 1	Fayette County	Kentucky
May 3	Rice County	Minnesota
May 8	Sangamon County	Illinois
May 19	Boone County	Missouri
June 6	Genesee County	New York
June 9	Chester County	Pennsylvania
June 23	Kit Carson County	Colorado

Wallace Butler mentions the fact that durum wheats are resistant in Texas.

Recent literature (See also literature under stem rust):

1. Kightlinger, C. V. Preliminary studies on the control of cereal rusts by dusting. Phytopath. 15: 611-613. Oct. 1925.

2. ---------- and H. H. Whetzel. Second report on dusting for cereal rusts. (Abstract) Phytopath. 16: 64. Jan. 1926.

3. Maresquelle, H. J. Compte rendu des rouilles des blés à Bellevue en 1924. (Wheat rust at Bellevue, near Paris, 1924.) Rev. Path. Vég. et Entoml. Agr. 12: 56-57. 1925.

STRIPE RUST CAUSED BY PUCCINIA GLUMARUM (SCHM.) ERIKS. & HENN.

Traces of stripe rust were reported from Utah, Idaho, Washington, and Oregon but in no state was the disease said to be of any particular importance.

Recent literature:

1. Desprez, F. Observations sur la rouille. (Observations on rust.) Journ. Agr. Prat. 89: 118-120. 1925.

2. Ducomet, V. Nouvelles observations sur les rouilles. (Further notes on rusts.) Rev. Path. Vég. et Entoml. Agr. 12: 60-64. 1925.

SCAB CAUSED BY GIBBERELLA ~~SAUBINETTI~~ SAUBINETII (MONT.) SACC.

Practically all states are unanimous in reporting much less scab than the average year or last year. However, in the spring wheat areas of Wisconsin,

Minnesota, and North Dakota the disease was of considerable importance. In Minnesota it was reported as causing about 2 per cent loss, and was most severe in the southern and west central parts of the state. In North Dakota it occurred in the eastern section, and 1 per cent loss was estimated.

A glance at the figures showing departures from the normal precipitation for May and June show that those two months were much drier than normal. June in Wisconsin, Minnesota, and North Dakota, however, was wet, which probably accounted for the prevalence of the disease on some of the spring wheat in those states. A map showing the precipitation for June 1925 (Fig. 4), brings out the fact that southern and western Minnesota, northeastern South Dakota, and southeastern North Dakota had more than 6 inches of rainfall during this month. This amount of moisture coming at the time of heading would probably favor scab infection.

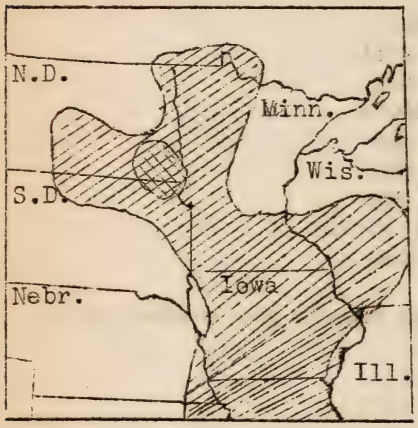

Fig. 4. Spring wheat area where total June rainfall equalled or exceeded six inches, 1925.

Dates of earliest observations:

June	Delaware	Kent County
June 9	Pennsylvania	Chester County
June 23	Illinois	Piatt County
June 30	Minnesota	Carver County
June 30	Wisconsin	Dane County.
July 22	North Dakota	Cass County

Table 81. Estimated percentage reduction in yield due to wheat scab during 1925.

Percentage loss	States reporting	Percentage loss	States reporting
2	Minnesota	0.1	Ohio, Kentucky
1	North Dakota, North Carolina	Trace	New York, Delaware, Virginia, West Virginia,
0.7	Pennsylvania		Indiana, Michigan,
0.6	Illinois		Wisconsin, Iowa,
0.5	New Jersey, Maryland		Missouri, Tennessee

NEMATODE, TYLENCHUS TRITICI (STEIN.) BAST.

The only states reporting wheat nematode in 1925 were Virginia, West Virginia, and North Carolina. In the former state it occurred in about average amounts, causing less than 1 per cent reduction in yield. Fromme and Godkin reported one case where a 20 per cent loss occurred in a field from clean wheat sown on land that had borne a slightly diseased crop last year. In West Virginia it was of only minor importance, occurring only in the southeastern section bordering Virginia. In North Carolina the disease was found on four farms in Lincoln County, June 10. It is thought to occur in several of the Piedmont and mountain counties of the state, according to Lehman.

During the past year two secondary diseases, associated with nematode injury have been reported from abroad. Fahmy and Mikhail (2) have reported a bacterial disease caused by Pseudomonas tritici Hutch. occurring widely throughout lower Egypt. It is thought to be of Indian origin and is causing considerable trouble in the Huidi variety of wheat in the lower region. It is associated with the nematode, attacking the plant following injury by that organism, and being disseminated largely by the eelworms. Out of 100 heads attacked by this bacterium no grain was obtained, while out of 100 heads infected by eelworms alone, 27 grams of wheat was harvested as compared with 82 grams from 100 healthy heads.

The other disease which is associated with nematode injury and the organism of which is disseminated by the nematodes is that reported by Atanasoff (1). The fungus Dilophospora alopecuri has been known in Europe for nearly a century and has always been noted in association with nematode infection. Atanasoff maintains that when the spores come into contact with the Tylenchus larvae they become firmly attached to it by means of the spore bristles and are carried between the leaf sheathes of the young plant to a point near the growing apex, where they germinate and parasitize the young leaves, weakened by the feeding of the larvae. In itself this fungus appears to be non-parasitic, but associated with the nematode it damages the plants.

Recent literature:

1. Atanasoff, D. The Dilophospora disease of cereals. Phytopath. 15: 11-40. 1925.

2. Fahmy, T., and T. Mikhail. The bacterial disease of wheat caused by Pseudomonas tritici (Hutchinson). Agr. Jour. Egypt, New Annual Series 1923, 1: 64-72. 1925.

3. Pape, Heinrich. Ein neuer Fundort der Federbuschsporenkrankheite des weizens in Deutschland (Mit einer Uebersicht über das bisherige Auftreten der Krankheit an Getreide in Deutschland) Illustr. Landw. Zeit. 45: 482-484. Sept. 1925.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot was reported on wheat from Minnesota, North and South Dakota, and Nebraska. Since durum wheat seems to be especially susceptible it is not unlikely that most of the reports in these states concern it. The statement is made that in North Dakota it was too cool and wet at blossom time to favor infection and that no epidemic has occurred since 1921 when it was serious. The losses for this year amount to only a trace.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose was reported from New York southwestward to Tennessee and westward to Wisconsin and Ohio. Of the 14 states reporting on cereal diseases west of the Mississippi River, only one, Iowa, reported any anthracnose and that was a bare trace. In none of the states was it of any economic importance

this year and in the majority of them it was less serious than usual. It was mentioned by the collaborator in Pennsylvania that dry weather greatly reduced the amount of injury, and it is probable that this was true for other eastern states where anthracnose occurred.

GLUME BLOTCH CAUSED BY SEPTORIA NODORUM BERK.

Seventeen states, for the most part in the eastern and north central portions of the country, reported glume blotch. The only state west of the 100th meridian reporting it was California, where it was said to be worse than usual, causing shriveling of kernels. In no state were the losses heavy. Pennsylvania and North Carolina reported 1 per cent loss and New York from a trace to 0.5 per cent. All other states indicated that it was of very slight importance and the losses averaged only a trace. The first report of the occurrence of this disease in Maine was received in 1925. Dry weather was thought to be responsible for the decreased amounts of this disease in the majority of the states.

Dates of earliest appearance:

June 4	Pennsylvania	Chester County
July 12	North Dakota	Cass County
July 25	New York	Yates County
July	Minnesota	Ramsey County

In California, W. W. Mackie reported great varietal variation. Some wheats were free from attack while others growing beside them showed 100 per cent infection.

SPECKLED LEAF BLOTCH CAUSED BY SEPTORIA TRITICI DESM.

This wheat disease was reported from New York, Pennsylvania, Maryland, Virginia, Tennessee, Arkansas, Illinois, Wisconsin, Minnesota, South Dakota, Kansas, Idaho, and California. Most of the collaborators reporting mention it as being less prevalent than usual and it was suggested by some of them that dry warm weather probably was unfavorable to its development. May and June were dry months. May was cooler than normal, however, but June was for the most part warmer than normal in eastern United States. Speckled leaf blotch was of only slight economic importance, practically all states reporting only a trace of loss. According to Tehon, it is usually very prevalent in Illinois, but in 1925 it was almost absent.

BLACK CHAFF CAUSED BY BACTERIUM TRANSLUCENS UNDULOSUM SMITH, JONES, & REDDY

Black chaff was reported west of the Mississippi River in the Great Plains states from Minnesota and Montana to Arkansas and Oklahoma. It was

also reported from Idaho, and it occurred in the Experiment Station plots at Madison, Wisconsin, and in one field in Illinois. In most states there was less or about the same amount as usual although North Dakota and Montana reported more than last year, with 1 and 2 per cent losses respectively. In general the disease was relatively unimportant.

North Dakota: I noted quite a little black chaff in the eastern part of the state. I should say that in some fields the infection was between 50 and 75 per cent. I only found it in a few fields in the southeastern part of the state. (G. C. Mayoue)

Dates of earliest appearance as reported by collaborators were June, Altamont, South Dakota; June 27, Christine, North Dakota; June 30, Chaska, Minnesota; and July 6, Piatt County, Illinois.

Collaborators in Minnesota and North Dakota report Kota as susceptible.

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

This disease was reported widely in various parts of the country from New York and Virginia westward to Oregon and California, but for the most part it was, as usual, only a very slight factor in reducing the yield of wheat; however, in Pennsylvania and Maryland 0.3 and 0.5 per cent losses were reported, and in South Dakota, Kansas, and California it was mentioned as being more prevalent than usual. In Kansas it was very common in some fields and in some instances seemed to be doing some damage. It was not widespread enough, however, to affect the yield of the crop in the state. In California it was very abundant this year, and, according to W. W. Mackie, caused considerable loss by its late attack, destroying leaves and weakening the plants.

In Wisconsin, according to Vaughan, it was only noted on winter wheat and late in the fall. In Indiana, E. B. Mains reported that in the field it seldom was seen but in the greenhouse it was very troublesome in wheat investigations. He noted marked differences in the susceptibility of varieties. Norka, C. I. 4377, Khapli emmer, and a strain of Michigan Amber showed marked resistance.

TAKE-ALL CAUSED BY OPHIOBOLUS GRAMINIS SACC.

Take-all in 1925 was reported to the Plant Disease Survey from New York, North Carolina, Kansas, and Oregon. In New York it was considered as unimportant and caused less than 1 per cent reduction in yield. In North Carolina, according to G. W. Fant, it was found in an additional county, making a total of six counties in the state from which specimens have been collected. He estimates that it probably caused about one-half of one per cent reduction in yield for the state. The new occurrence was near Mocksville in Davie County. In Kansas the disease was identified by Hurley Fellows in the following counties: Riley, Dickinson, Marion, Harvey, McPherson, Rice, and Barton. He also made examinations in Reno and Saline Counties but found no take-all. Another Kansas

occurrence was noted by C. O. Johnson in Kiowa County, and a specimen was received at Manhattan from Ellis County.

In Oregon, Barss reported more take-all than last year and stated that it was important where it occurred. The reduction in yield for the state, however, was not more than a trace. Some fields where wheat followed grass on clover sod showed much more than others where wheat was the preceding crop. In California, W. W. Mackie reported as follows:

> "Foot rot (apparently Ophiobolus) was universal and very destructive. Hard Federation, White Federation, and Federation varieties were particularly susceptible, but none were immune. It caused sterility of flowers, shriveling of kernels, and death of plants from the seedling stage to maturity."

The disease is considered very important in the state, and it is estimated that it caused about 10 per cent loss. As indicated in Mackie's report, it is not certain that this is entirely the take-all disease caused by Ophiobolus; other things may be associated with it.

During the past two years take-all has been found causing considerable loss in a large number of spring wheat fields of northwestern Saskatchewan, Canada, as reported by Frazer, Simmonds, and Russell (3) at the Kansas City meeting of the American Phytopathological Society. They reported that the fungus seems to be indigenous to the area and is parasitic on a number of native grasses, particularly those with rhizomes. They found the disease occurring on land which had never before been planted to wheat.

Recent literature:

1. Davis, R. J. Studies on Ophiobolus graminis Sacc. and the take-all disease of wheat. Jour. Agr. Res. 31: 801-825. Nov. 1, 1925.

2. Fellows, Hurley. The influence of carbon dioxide and oxygen on the growth of Ophiobolus graminis in pure culture. (Abstract) Phytopath. 16: 81. Jan. 1926.

3. Frazer, W. P., P. M. Simmonds, and R. C. Russell. The take-all disease in Canada. (Abstract) Phytopath. 16: 80-81. Jan. 1926.

4. Guyot, L. De l'existence de formes pycnidiennes chez Ophiobolus graminis Sacc., et Ophiobolus herpotrichus (Fr.) Sacc. Rev. Path. Vég. & Entom. Agr. 12: 74-81. Jan.-Mar. 1925.

5. Kirby, R. S. The take-all disease of cereals and grasses caused by Ophiobolus cariceti (Berk. & Broome) Sacc. New York (Cornell) Agr. Exp. Sta. Mem. 88: 3-45. 1925.

6. McKinney, H. H., and R. J. Davis. Preliminary environmental studies of the take-all disease of wheat caused by Ophiobolus graminis Sacc. Phytopath. 15: 494-495. 1925.

7. McKinney, H. H., and R. J. Davis. Influence of soil temperature and moisture on infection of young wheat plants by Ophiobolus graminis. Jour. Agr. Res. 31: 827-840. Nov. 1, 1925.

8. ---------- Foot-rot diseases of wheat in America. U. S. Dept. Agr. Bul. 1347: 1-40. Nov. 1925.

9. Melchers, L. E., and M. C. Sewell. The effect of tillage, fertilizers, and rotations on the spread of wheat foot rot. (Abstract) Phytopath. 16: 81. Jan. 1926.

10. Sewell, M. C., and L. E. Melchers. The effect of rotation and tillage on foot rot of wheat in Kansas 1920-1924. Jour. Amer. Soc. Agron. 16: 768-771. 1924.

FOOTROT CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

This disease was reported principally from the upper Mississippi and Missouri Valley states, although, according to collaborators, traces occurred in New York, Pennsylvania, Maryland, and California. North Dakota and Kansas reported losses of one percent, but all other states reported less than one per cent injury. In Wisconsin it was reported only on seedlings growing in the experimental plots at Madison. In North Dakota it was noted as rootrot, blotch of the leaves, and black point of grain. In California where the disease is usually rare, it was said to be more abundant this year than ever before, occurring particularly in the northern and coastal areas and causing blighting of the leaves.

Collaborators in twelve eastern states and one western mentioned that the disease had not been observed nor reported.

FOOTROT CAUSED BY WOJNOWICIA GRAMINIS (MCALP.) SACC. & SACC.

A footrot associated with this fungus was more prevalent than during previous years in Oregon and was apparently of considerable importance in winter wheat. Many fields showed 25 per cent down grain and the worst fields showed as high as 75 per cent. The trouble may be avoided by planting spring grain, according to Barss. Wojnowicia is associated with the foot rot complex in Kansas.

Recent literature:

Guyot, L. De l'existence de formes pycnidiennes chez Ophiobolus graminis Sacc., et Ophiobolus herpotrichus (Fr.) Sacc. Rev. Path. Vég. & Entom. Agr. 12: 74-81. Jan.-Mar. 1925.

Pycnidia of Wojnowicia graminis have been found frequently on cereals infected by Ophiobolus and also in conjunction with Leptosphaeria. It has also been reported on wheat entirely free from footrot and on other cereals and

grasses. Seedlings of wheat and other cereals are easily infected with the fungus. Wojnowicia graminis is considered to be a definite wheat parasite quite distinct from Ophiobolus graminis. It attacks young wheat plants, but appears rather as a secondary than as a true parasite.

ROOTROTS (CAUSE UNDETERMINED)

W. D. Valleau in Kentucky reported that foot and root rots of wheat caused minimum losses this year because of nearly ideal weather for wheat development. Pathologists in Minnesota reported less undetermined foot rot than usual, but as much as 10 per cent damage occurred in individual fields and a loss of 0.75 per cent was estimated for the state. In South Dakota, while the foot rot seemed to be less serious than usual, on the whole it did considerable damage, especially in the northern part, and the loss was estimated at one per cent. In Kansas the root rot situation is complicated by the fact that several fungi, including Helminthosporium, Ophiobolus, and Wojnowicia, are associated with the disease. The work in Kansas on tillage as a control measure has been mentioned under the heading "take-all". In Washington a single report of an unidentified foot rot was received from the Spokane Valley.

PINK ROOT CAUSED BY FUSARIUM SP.

This disease is reported only from California by W. W. Mackie who states that it was worse than last year and worse than usual, and caused considerable loss (about 4 per cent). It caused the death of plants at all stages from seedling to maturity, blasting spikelets, and shriveling kernels. It occurred in all parts of the state but was worse in the northern and coastal areas. It attacks oats and barley as well as wheat, and has been known by the California pathologists for as long as ten years.

MOSAIC (CAUSE UNDETERMINED)

From the recent work of McKinney (1) it now appears that the rosette of wheat, originally found near Granite City, Illinois, and known to occur in Indiana and Illinois, is in reality an extreme manifestation of mosaic. On susceptible varieties of winter wheat, such as Harvest Queen, extreme dwarfing of plants and a bluish green coloration of leaves, previously considered as the principal symptom of rosette, occurs, while on other wheats such as Currell the characteristic mosaic mottling takes place. The mottling has also been observed on winter rye.

McKinney (1 & 2) and McKinney, Webb, and Dungan (3) find that the causal agent of this mosaic is capable of persisting in the soil from year

to year. Susceptible varieties of winter wheat never have failed to develop the disease when grown in infested soil out of doors. Artificial inoculation of Harvest Queen wheat with juice from mosaic infected Currell has produced the symptoms characteristic of rosette while inoculation of Currell with the expressed juice from diseased Harvest Queen has produced characteristic leaf mottling.

None of the collaborators reported mosaic or rosette this year. The distribution of the rosette disease as given by McKinney, Webb, and Dungan (3) is shown in the following table.

State	County	Number of infested fields found	Approximate acreage of infested fields
Illinois	Madison	27	670
	Mason	48	1,310
	Sangamon	2	380
	Logan	1	20
Indiana	La Porte	7	213
	Porter	6	120
	Tippecanoe	1	5

Recent literature:

1. McKinney, H. H. A mosaic on winter wheat and winter rye. Phytopath. 15: 495-496. Aug. 1925.

2. ---------- A mosaic of winter wheat and winter rye. U. S. Dept. Agr. Bul. 1361: 1-10. Sept. 1925.

3. ---------- R. W. Webb, and G. H. Dungan. Wheat rosette and its control. Illinois Agr. Exp. Sta. Bul. 264: 275-296. 1925.

OTHER DISEASES

Basal glume rot caused by Bacterium atrofaciens McC. - Pennsylvania and Arkansas are the only states reporting this disease. In Pennsylvania it was less prevalent than last year and was of no economic importance. It was collected June 10 at Media by R. S. Kirby. In Arkansas there appeared to be more and it was noted occurring on various varieties but not causing any serious injury.

Sooty mold caused by Cladosporium herbarum (Pers.) Lk. - Reported to the Plant Disease Survey from Maine for the first time.

Stripe (undet.) - Traces of stripe were reported from Pennsylvania and Illinois. In Pennsylvania it was found only on wheat from New York seed. In Illinois it was mentioned as occurring in much less abundance than last year.

Marasmius tritici was reported during the year by Young growing on decayed stems of wheat, rye, barley, and quack grass. (Young, P. A. A Maras-

mius parasitic on small grains in Illinois. Phytopath. 15: 115-118. 1925)

Freezing injury. - Two states reported on freezing injury as follows:

Ohio: The late frosts of the spring season are thought to have caused more loss to the wheat crop in certain sections of Ohio than occasioned by disease. This is manifested by failure of the heads to fill out, or to only partially fill. In many fields over 25 per cent decrease in yield is found. (Thomas)

Indiana: Very common, causing 75 per cent loss in some cases, however, it averaged only from 2 to 5 per cent for the entire state. It occurred generally throughout the state except in the extreme southern part and the injury occurred to the heads, wholly or partly killing them. Low temperatures of May 25 to 27 were responsible. The wheat was in boot at that time. In some cases the entire head was killed and in other cases only certain spikelets. Where heads were completely killed there was a heavy accumulation of sugar in the stems which turned purple in color. (Gregory)

R Y E

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Several widely scattered states reported slight amounts of stem rust on rye. In general there was less than, or about the same amount as usual; although in California where rye is usually free from stem rust, it was common but did not do much damage. Collaborators mention early maturity of rye, dry weather, and gradual elimination of barberries as being factors limiting the occurrence of stem rust this year.

Table 82. Estimated losses from stem rust of rye according to collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
1	Connecticut, New York, Michigan, South Dakota	Trace	Pennsylvania, Delaware, Maryland, Virginia,
0.2	Iowa		West Virginia, Wisconsin,
0.1	Ohio		Minnesota, Missouri, North Dakota, Arkansas, Idaho, California

In Michigan, collaborators report that there seems to be considerable of the race of Puccinia graminis that is specialized to rye in the state, and that some of it could be found in all rye fields reasonably close to barberries.

In Virginia, only traces were seen on rye in the section where it was very prevalent on wheat.

Recent literature:

1. Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. (Abstract) Phytopath. 15: 58-59. Jan. 1925.
Selections from Abruzzes rye showed wide variations in susceptibility to each of these diseases. Some highly resistant races were found. Resistance to each disease is dominant.

LEAF RUST CAUSED BY PUCCINIA DISPERSA ERIKS.

As in the case of leaf rust of wheat, the leaf rust of rye was less prevalent than normal. This probably was because of dry spring weather, although, as pointed out by Mains in his report for Indiana, a severe winter might also have been influential in holding the rust in check. No state reported more leaf rust than last year nor more than the average year. States reporting about the usual amounts were Connecticut, Maryland, Tennessee, South Carolina, Florida, Wisconsin, Minnesota, and Kansas; while those reporting less or much less than normal were Virginia, Georgia, Texas, Arkansas, Ohio, Indiana, Illincis, Michigan, and Colorado.

Collaborators are almost unanimous in reporting that the rust did only slight damage and many of them report no damage whatever. In Illinois, however, it was said to have been the most important rye disease. Losses are given in table 83.

Table 83. Estimated losses from leaf rust of rye, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
5	Florida	0.1	Georgia, Ohio
2	South Carolina	Trace	Virginia, Indiana,
1	Connecticut, New Jersey, Maryland		Wisconsin, Minnesota, Iowa, Nebraska,
0.5	New York, Pennsylvania		Kentucky, Arkansas,
0.4	Illinois		California

Mains (1) has made some selections from Abruzzes rye which are resistant to leaf rust as well as stem rust and powdery mildew.

Recent literature:

1. Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. (Abstract) Phytopath. 15: 58-59. Jan. 1925.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot was another cereal disease that in general was somewhat less prevalent than usual owing to a dry spring. In Minnesota, however, it was more abundant than normal, being present in all rye fields and causing a loss estimated at 0.5 per cent of the crop. In one field 50 per cent of the heads were affected. In North and South Dakota also it was of considerable economic importance. In these three states June precipitation was above normal whereas in most of the other eastern states it was below normal. This fact may explain the greater abundance of ergot in these spring wheat states.

In Michigan collaborators reported difficulty in finding affected heads, and in Kansas ergot was extremely rare in commercial fields.

Table 84. Estimated losses from ergot of rye, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
1	North Dakota, South Dakota, Ohio	Trace	New York, New Jersey, Virginia, Michigan, Wisconsin, Iowa, Utah, Idaho
0.5	Minnesota		
0.2	Kentucky		

It was first observed in Wisconsin on June 20 at Madison; in Minnesota, June 14 at St. Paul; and in North Dakota, July 8 at Fargo.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Only five states, New York, Pennsylvania, Tennessee, Ohio, and Wisconsin, reported anthracnose in 1925. In New York it was noted principally in the Hudson River Valley and caused less than one per cent loss. In Pennsylvania, R. S. Kirby reported less than usual, but in spite of that it was the most important rye disease, causing a loss estimated at 3 per cent for the state. In Tennessee anthracnose occurred in about the usual amounts. In Wisconsin it was more prevalent than usual, according to Vaughan, and caused a reduction in yield estimated at 2 per cent.

STEM SMUT CAUSED BY UROCYSTIS OCCULTA (WALLR.) RABH.

States reporting stem smut were New York, Pennsylvania, Virginia, Illinois, Michigan, Wisconsin, Minnesota, North Dakota, and Idaho. In Pennsylvania, where there was more than usual, it was considered to be one of the most destructive rye diseases in the state, causing a loss of 1.5 per cent. Only traces were reported from other states, with the exception of Minnesota which reported 0.5 per cent loss. According to Kirby good control was obtained in Pennsylvania by treating seed with copper carbonate dust at the rate of 3 to 4 ounces per bushel.

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) ROSTR.

Humphrey and Tapke (1) have recently reported that, as a result of microscopic study and cross inoculation experiments, they have concluded that the loose smut of rye is caused by Ustilago tritici, the organism causing the loose smut of wheat. They inoculated the heads of Stoner, Fultz, and Leap wheat, as well as Rosen and Rimpau rye with spores of loose smut from Rosen rye and from Goens wheat and secured infection in every case. Although loose smut now has been collected on rye in North Dakota, Illinois, Indiana, Kentucky, Minnesota, Missouri, New York, Oklahoma, Tennessee, Virginia, and West Virginia, the reports of occurrence have not included mention of the variety of rye on which the disease was found. The work of Humphrey and Tapke indicates considerable differences in susceptibility. Out of 13 varieties and selections that they have examined in 1922, 1923, and 1924, only two, Rosen and Rimpau, were found with loose smut.

Recent literature:

1. Humphrey, Harry B., and Victor F. Tapke. The loose smut of rye, (Ustilago tritici). Phytopath. 15: 598-605. Oct. 1925.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Traces of scab were reported from New York, Pennsylvania, Maryland, Tennessee, Wisconsin, North Dakota, and Iowa, but it was of very minor importance in all of these states. Collaborators in nineteen states sent in reports of non-occurrence on rye.

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

This disease doubtless occurred widely, as usual, but it was observed and reported by collaborators only from the ten states of Massachusetts, Connecticut, New York, Pennsylvania, Maryland, Indiana, Wisconsin, Minnesota, South Dakota, and California. Reports from Massachusetts, Indiana, and Wisconsin mention it as occurring especially in the fall on seedling plants. Losses of 0.2 per cent and 1 per cent were reported from Pennsylvania and Maryland, respectively. E. B. Mains (1) of Indiana indicates that considerable differences in varietal susceptibility have been found, some selections from Abruzzes rye proving highly resistant.

Recent literature:

1. Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. (Abstract) Phytopath. 15: 58-59. Jan. 1925.

MOSAIC (CAUSE UNDETERMINED)

"In the spring of 1925, it (mosaic) was observed on winter rye growing in infested soil at Granite City, Illinois, and in the same soil which had been transported to Madison, Wisconsin, for experimental study. What appears to be the same mosaic was also found by Dr. A. G. Johnson in winter rye growing as a cover crop in the orchards of the U. S. Department of Agriculture, Arlington Farm, Virginia. Microscopic examinations of mosaiced rye plants from all these sources reveal the presence of cell inclusions which are very similar to, if not identical with, those associated with wheat mosaic." (McKinney, (2)).

Recent literature:

1. McKinney, H. H. A mosaic disease of winter wheat and winter rye. U. S. Dept. Agr. Bul. 1361: 1-10. Sept. 1925.

2. ---------- A mosaic on winter wheat and winter rye. Phytopath. 15: 495-496. Aug. 1925.

OTHER DISEASES

Helminthosporium sativum Pam., King, & Bak., leafspot, occurred in New York wherever rye was grown, and was reported from Pennsylvania.

Rhynchosporium secalis (Oud.) Davis, scald, was abundant on rye in experimental plots at Corvallis, Oregon, according to Barss. It was worse where barley preceded on the same ground the year before.

Bacterial leafspot, cause undetermined, occurred on the Experiment Station farm at Fort Collins, Colorado. One hundred per cent leaf infection was reported.

Fusarium sp. causing footrot was reported from New York (mostly in Hudson Valley).

Rootrot, due to various fungi. Very little in Minnesota this year. (Sect. Plant. Path.)

Recent literature:

1. Roussakov, L. F. Massenhafter Befall von Winterroggen durch Puccinia coronifera Kleb. im Herbst. 1924. (An epidemic attack of Puccinia coronifera Kleb. on winter rye in the autumn of 1924.) Angew Bot. 7: 262-266. 1925.

During an expedition to the Kamennaya Steppe, Russia in the autumn of 1924, Puccinia coronifera Kleb. (P. lolii) was observed in epidemic form on rye. It is thought that drought conditions reduced the normal resistance of rye to attacks by this rust.

B A R L E Y

COVERED SMUT CAUSED BY USTILAGO HORDEI (PERS.) KELL. & SW.

Of the twenty-six states reporting on this smut, only three, Maryland, Colorado, and California reported more than normal amounts. The other states reported the same or less. In New York the statement was made that the smut seems to be increasing. In Arkansas it is an important disease of barley, causing as high as 10 per cent loss, but inasmuch as the crop is not grown to any extent, it is not of much economic importance. In Colorado the losses were high, 55 per cent having been observed in one field and the average loss for the state being estimated at 5 per cent. In California also, where the disease was much worse than usual, 7 per cent loss was estimated and a maximum of 60 per cent was observed in one field. W. W. Mackie of California remarks that, because this smut occurs irregularly, neglect of seed treatment caused heavy losses this year.

Table 85. Estimated reduction in yield due to covered smut as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
10	Arkansas	1.5	New Jersey, Pennsylvania
7	California	1	Maryland, Iowa, North Dakota, Idaho
5	Colorado, Kentucky		
3	Virginia	0.75	Minnesota
2.5	Kansas	0.5	Connecticut, Texas
2	South Dakota, Arizona		

LOOSE SMUT CAUSED BY USTILAGO NUDA (JENS.) KELL. & SW.

The only states reporting more loose smut than usual were Maryland and Illinois. The others reported normal amounts for the most part. As usual the disease was generally distributed all over the country.

It was the most important disease of barley in Pennsylvania, according to collaborators, and the second most important in Illinois, where stripe is the major barley disease. In Michigan also stripe was said to be more abundant than the covered smut.

Dates of earliest appearance:

June 2	Delaware	New Castle Co.	June 8	Illinois	Olmsted
June 4	South Carolina	Clemson College	June 25	Colorado	Eastern portion
June 4	Missouri	Columbia	June 28	Pennsylvania	State College
June 4	Minnesota	University Farm			

Table 86. Estimated reduction in yield due to loose smut of barley as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
10	Arkansas	1.5	Connecticut, Minnesota, Kansas
4	Pennsylvania		
3	Illinois	1	Iowa, North Dakota, South Dakota, Arizona
2.5	New York, Kentucky		
2	Maryland, Michigan	0.5	Texas, California

At San Antonio, Texas, and Sacaton, Arizona, A. G. Johnson observed that during April, under the extremely dry conditions that existed, the smut invaded the upper leaves.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust of barley appeared to be of about normal prevalence during 1925 but in Minnesota and Idaho more infection was reported than last year. It apparently was of very slight importance, only three states reporting losses greater than 1 per cent. These were Iowa, 2 per cent; and South Dakota and Texas each 1 per cent. In Michigan it was noted that some fields suffered severely when in close proximity to barberry. In Wisconsin and Minnesota barley fields ripened before rust had a chance to do much damage, according to the reports. Dates of earliest observations reported by collaborators were: June 20, Hutchinson, Minn., June 22, Shippensburg, Pa., June 25, Burlington, Colo., and July 11, Freeport, Ill.

LEAF RUST CAUSED BY PUCCINIA ANOMALA ROSTR.

Like the other leaf rusts, Puccinia anomala (P. simplex) occurred in sub-normal amounts, the reason probably being the dry weather occurring during the period of normal infection. Nineteen states reported its occurrence but in none was the loss estimated to be more than one-half of one per cent, being only a trace in practically all cases. Texas, Connecticut, and Ohio estimated 0.5, 0.25, and 0.1 per cent reduction in yield, respectively. In Michigan it was stated that considerable infection occurred but too late to do any damage. Differences in the susceptibility of varieties were noted in California. It was first observed Jan.24 at Harlingen, Texas, June 4 at Clemson College, S. C., and July 28 at Clarion, Pa.

STRIPE CAUSED BY HELMINTHOSPORIUM GRAMINEUM RABH.

In Wisconsin, New York, Nebraska, and California, stripe was more prevalent than usual according to collaborators. In the other states apparently it was of about the same, or of less prevalence than usual. It was widespread, occurring in barley states from New York to California. In Illinois, it was said to be especially abundant in the extreme northern part of the state while in Wisconsin it was especially prevalent in the southern part. It was an important barley disease in Illinois, Michigan, Wisconsin, Iowa, North Dakota, South Dakota, Montana, Utah, and California. In Washington, only a single case was observed and, from Oregon, the report was received that it tended to eliminate itself in that state.

Table 87. Estimated reduction in yield due to barley stripe as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
5	Iowa	1.5	Michigan
3	Illinois, South Dakota, California	1	Wisconsin, North Dakota
		0.5	Minnesota
2	Utah	0.25	Colorado

As high as 75 per cent infection was observed in one field in Michigan. Other maximum percentages noted were, Illinois 12.9, Wisconsin 10, and Minnesota 10.

Dates of earliest appearance:

May 8	South Carolina	Clemson College	June 10	Illinois	Paris
May 25	Minnesota	University Farm	June 28	Pennsylvania	State College
June 2	Delaware	New Castle Co.	July 2	North Dakota	Fargo

A. G. Johnson reported that due to the extremely dry conditions prevailing in Texas and Arizona, barley plants affected with stripe remained chiefly in the rosette stage.

The varieties Minsturdi and Odessa were reported as very susceptible in Minnesota.

A number of workers have reported on the control of barley stripe by means of various seed treatments, during the year. (See references 1-4)

Recent literature:

1. Gram, E., and Sofie Rostrup. Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1924. (Survey of the diseases of agricultural and horticultural cultivated plants in 1924.) Tidsskr. for Planteavl. 31: 353-417. 1925.

Appears to be on the increase, especially on Gold, Prentice, and Karl varieties. Good control with germisan or tillantin C. Dusting with germisan or $CuCo_3$ also proved satisfactory.

2. Johnson, T. Studies on the pathogenicity and physiology of Helminthosporium gramineum Rabh. Phytopath. 15: 797-804. Dec. 1925.
Low soil temperatures favor infection, the greatest infection occurring at 10° to 12° C. Very little infection took place at soil temperatures of 20° C. Infection by means of inoculation was secured. By removing the hulls infection was increased. Evidence was obtained indicating physiologic specialization of H. gramineum.

3. Neuweiler, E. Bericht über die Tätigkeit der Schweizerischen Landwirtschaftlichen Versuchsanstalt Oerlikon in den Jahren 1920-1923. IV. Pflanzenschutz. (Report on the work of the Swiss Agricultural Experiment Station Oerlikon during the years 1920-1923. IV. Plant protection.) Landw. Jahrb. der Schweiz. 39: 252-260. 1925.
Satisfactory control with germisan, tillantin, segetan, kalimat, and fungolit.

4. Russell, H. L., F. B. Morrison, and W. H. Ebling. Plant disease investigations of the Wisconsin Station. In Wisconsin Agr. Exp. Sta. Bul. 373: 5-16. 1925.
Cresol-mercury and phenol-mercury compounds more effective in control of stripe than formaldehyde or copper sulphate.

5. Van Poeteren, N. Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1924. (Report of the activities of the Phytopathological Service in the year 1924.) Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen 41: 62 pp. 1925.
Germisan gave better control than copper sulphate or uspulun reducing the incidence from 763 (in control) to 1, when applied at the rate of 100 gm. germisan to 3 liters water per hectol. of seed, and to 4 and 6 respectively when 75 or 50 gms. were used.

6. Vogt, E. Ein beitrag zur kenntnis von Helminthosporium gramineum Rbh. (A contribution to the knowledge of Helminthosporium gramineum Rbh.) Arb. Biol. Reichsanst. Land. u. Forstw. 11: 387-397. 1923.

SPOT BLOTCH CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

New York, Pennsylvania, Virginia, West Virginia, Minnesota, Iowa, North Dakota, Kansas, Colorado, and California reported spot blotch in 1925. All of those reporting on relative prevalence mentioned it as being about as usual. Negative reports were received from fourteen widely scattered states. The disease was of very minor importance in all states; only traces of loss being reported with the exception of Pennsylvania and Minnesota from which 1 per cent and 0.75 per cent loss was reported respectively.

Recent literature:

1. Christensen, J. J. Physiologic specialization and mutation in Helminthosporium sativum. Phytopath. 15: 785-795. Dec. 1925.

2. Griffee, F. Correlated inheritance of botanical characters in barley, and manner of reaction to Helminthosporium sativum. Jour. Agr. Res. 30: 915-935. 1925.

NET BLOTCH CAUSED BY PYRENOPHORA TERES (DIED.) DRECHS.

Net blotch occurred in normal amounts, according to collaborators reporting. Thirteen widely scattered states from New York and Virginia westward to Arizona and California reported it. In general it was of minor importance, only traces of loss being reported in all cases except Iowa.

Dates of earliest observation reported were: May 15, Madison, Wis., June 22, Shippensburg, Pa., July 2, University Farm, Minn., and July 10, Wichert, Ill.

W. W. Mackie of California reported that difference in varietal resistance was very marked.

SCALD CAUSED BY RHYNCHOSPORIUM SECALIS (OUD.) DAVIS

Scald of barley appears to have been of importance only in the Pacific Coast region. Reports of non-observance were made from eighteen states, but traces of scald were reported from Wisconsin, Iowa, Kansas, and Idaho, while in western Oregon it was said to be common on barley and the cause of some loss. In California, according to W. W. Mackie, it was much worse than usual and of very great importance, killing the leaves, shriveling the kernels, and weakening the plants to such an extent that a reduction in yield of probably 25 per cent occurred. It did more damage than it has for years in California, especially in the Sacramento and San Joaquin Valleys.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Traces of scab were reported from New York, Pennsylvania, Maryland, Wisconsin, Iowa, and North Dakota. Eighteen other states reported that the disease had not been seen. In Minnesota, no scab was observed on the heads but root rot attributed to the scab organism was noted. In none of the states reporting scab did it do much damage to barley.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

The only states reporting ergot were Indiana, Minnesota, South Dakota, Iowa, and Nebraska. Only an occasional infected plant was found in these states. The disease may, therefore, be said to have been of no economic importance on barley.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Traces of anthracnose were observed in Pennsylvania, Wisconsin, and Iowa. Nineteen other widely scattered states reported that the disease had never been found or was not observed in 1925. Only traces of loss were mentioned in the states reporting it.

OTHER DISEASES

Pink root caused by Fusarium sp. was said to be worse than usual in California, causing considerable damage. As much as 2 per cent loss was estimated. It took the form of a seedling blight and death or injury to mature plants, and occurred throughout the barley growing sections of the state.

Stripe rust caused by Puccinia glumarum (Schw.) Eriks. & Henn. was noted on barley in the rust nursery at Moscow, Idaho.

Powdery mildew caused by Erysiphe graminis DC. Reported from New York and Pennsylvania as of very slight importance.

Bacterial blight caused by Bacterium translucens Jones, Johnson, & Reddy was mentioned as occurring in Texas, Michigan, and Colorado. In one field in Jackson County, Michigan, from 50 to 75 per cent of the plants were affected. A bacterial blight which was probably the same disease was noted at Corvallis, Oregon, May 9.

Literature on other diseases:

1. Tasugi, H. and W. Yamanda. Stinking smut of the barley and the naked barley of Japan. (Preliminary report). Ann. Phytopath. Soc. Japan 1: 31-41. 1925. (English Summary)
First found on barley in Japan in 1913 since which time it has spread. It occurs in northern and cooler parts of Japan. Has been confused with Tilletia tritici and T. laevis as well as Ustilago hordei, all of which it resembles as far as symptoms are concerned. It corresponds with Tilletia pancicii Bub. & Ran.

2. Van Poeteren, N. Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1924. (Report of the activities of the Phytopathological Service in the year 1924.) Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen 41: 62 pp. 1925.

Among other diseases a barley leafspot, gray with a darker brown margin and caused by Marssonina secalis is reported.

OATS

LOOSE AND COVERED SMUTS OF OATS CAUSED BY USTILAGO AVENAE (PERS.) JENS., AND U. LEVIS (KELL. & SW.) MAGN.

In spite of the ease with which the oat smuts are controlled, the losses occasioned by them continue heavy. Seed treatment and to some extent the use of resistant varieties are reducing losses but these measures are practiced by only a portion of the farmers, and not every year by them, so that the average loss over the country as a whole seems to remain about the same year by year. An indication of the losses that might occur if control measures were not employed at all is given in the following percentages of smut observed in individual fields in several of the states last year. In Minnesota a field containing 80 per cent smutted heads was observed while collaborators in other states reported maximum percentages as follows: Georgia 40, Colorado 35, Pennsylvania 31, Arkansas 20, Ohio 20, Florida 15, Kansas 15, North Dakota 10, Arizona 10, and Wisconsin 10. The following average percentage reduction in yield on account of smuts in 1925 was reported by collaborators.

Table 88. Percentage losses from oat smuts as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
10	Arkansas	2	Maine, Connecticut,
6	Pennsylvania, Kentucky		New Jersey, Michigan,
5	Georgia, Minnesota, Utah		North Dakota, Arizona,
4	New York, Virginia, Ohio		Idaho, Oregon
3.4	Illinois	1.5	South Carolina, Colorado
3	Florida	1	West Virginia, Texas
2.5	North Carolina, Wisconsin	0.5	Kansas, Louisiana,
			California

Collaborators in 39 states reported on oat smut. Some of them mentioned the disease as more prevalent than usual, others the same, and still others, less. In Texas, Oklahoma, and Arkansas it was particularly mentioned that winter oats were not nearly so badly smutted as spring oats on which infection was heavy. It is not unlikely that temperature at the time of germination was a very influential factor in these states. The month of February, when the spring oats are planted in that area, was unusually warm, being 7.1° above normal.

In Michigan, a decrease in the amount of smut was mentioned with the statement that the very dry season following planting was perhaps responsible. A paper on the relation of temperature and humidity to smut infection has been published during the year by Trâen (16). He found that incidence of infection with Ustilago levis was greater at 15° and 20°C. than at 9°C. and that with favorable temperatures the heaviest infection occurred in moderately damp, rather than in wet, soil.

Considerable work has been reported during the past year on smut resistance of oat varieties. Reed and Stanton (11) studied the susceptibility of 92 F3 families of a cross between Fulghum and Swedish Select and noted a wide range of susceptibility. Twenty-five families showed resistance comparable to the resistant Fulghum parent. The F4 selections from resistant F3 families were in general very resistant. The selections appeared to behave in a similar fashion toward both loose and covered smuts. Reed, Griffiths, and Briggs (10) reported great variation of susceptibility within the species Avena sativa of which 90 varieties and 182 strains were test A few - Black Mesdag, Culberson, Caucasus, Danish Island, and Siberian proved very resistant to both smuts. A larger number proved highly susceptible but by far the greatest number were intermediate between the two extremes. Gaines (6) tested 210 varieties and selections for resistance to covered smut. Twenty-one of these remained smut-free over an 8 year period. Markton is one of the best of the immune selections. It has been increased and grown commercially since 1924.

In connection with their annual reports, collaborators were asked to give information on the kind of seed treatment that is being recommended in their states and to estimate the amount of formaldehyde used for treating oats. Replies were received from 24 states. In 23 of these, the formaldehyde treatment is used, while in one, California, copper carbonate also seems to be recommended. In the majority of the states, the standard formaldehyde spray method (one pint to 40 gallons of water) is recommended, but in Connecticut, New York, Pennsylvania, Georgia, Ohio, North Dakota, and Kansas, and probably other states the dry method (one pint formaldehyde to 1 pint of water sprayed on 50 bushels of oats) is also recommended and used rather extensively. In Indiana they are using one pint of formaldehyde to 5 gallons of water applied to 40 to 50 bushels of seed, while in Idaho the extensive and successful use of the Idaho modification of the concentrated spray treatment (one pint formaldehyde to 10 pints water, sprayed on 50 bushels of seed) is reported. Comparatively few collaborators ventured to estimate the amount of formaldehyde used in their states for treatment of oats; however, in New York, Illinois, and Iowa, it was estimated that 30, 10, and 3 per cent, respectively, of the seed that was sown was treated.

During the year, several papers have come out giving results of various seed treatment tests. Carne (1) states that the formaldehyde or blue stone treatments are more effective than copper carbonate dust. Dickson (3) using several compounds, chiefly dusts, found that the nickel dusts gave best results. Thomas (13, 14, 15) reported that of the copper and nickel dusts tried, none gave adequate control when used alone, but when combined with mercuric chloride some were quite effective and did not impair seed germination.

Recent literature:

1. Carne, W. M. Seed treatment for oat smut. Jour. Dept. Agr. Western Australia II, 2: 65. March 1925.

2. Coulson, J. G., and E. A. Lods. Oat smut infection in relation to size of grain. (Abstract) Phytopath. 15: 302-303. May 1925.

3. Dickson, B. T. Oat smut control tests at Macdonald College during 1924. (Abstract) Phytopath. 15: 301. May 1925.

4. ---------- Oat smut control experiments in 1923. Ann. Rept. Quebec Soc. Protection Plants 16 (1923/24): 77-79. 1925.

5. Gaines, E. F. The inheritance of disease resistance in wheat and oats. Phytopath. 15: 341-349. 1925.

6. ---------- Resistance to covered smut in varieties and hybrids of oats. Jour. Amer. Soc. Agron. 17: 775-789. Dec. 1925.

7. Gordon, W. L. Studies concerning injury to seed oats after smut disinfection. Ann. Rept. Quebec Soc. Protection Plants 16 (1923/24): 79-94. 1925.

8. Howe, Mary F. Changes in hydrogen-ion concentration induced by carbon dioxide in relation to the germination of spores of Ustilago levis. (Abstract) Phytopath. 16: 69-70 Jan. 1926.

9. Reed, Geo. M. The inheritance of resistance of oat hybrids to loose smut. Mycologia 17: 163-181. 1925.

10. ---------- Marion A. Griffiths, and Fred N. Briggs. Varietal susceptibility of oats to loose and covered smuts. U. S. Dept. Agr. Bul. 1275: 1-39. April 1925.

11. ---------- and T. R. Stanton. Relative susceptibility of selections from a Fulghum-Swedish Select cross to the smuts of oats. Jour. Agr. Res. 30: 375-391. Feb. 1925.

12. Sampson, Kathleen. Some infection experiments with loose and covered smuts of oats which indicate the existence in them of biological species. Ann. Appl. Biol. 12: 314-325. July 1925.

13. Thomas, R. C. Effective dust treatments for the control of smut of oats. Science n. s. 61: 47-48. 1925.

14. ---------- Control of smuts of wheat and oats with special reference to dust treatments. Ohio Agr. Exp. Sta. Bul. 390: 405-423. Dec. 1925.

15. Thomas, R. C., and Paul E. Tilford. Dust treatments for the control of oat smut. Ohio Agr. Exp. Sta. Bimonthly Bul. 11 (1): 18-23. Jan.-Feb. 1926.

16. Tråen, A. E. Ueber den Einfluss der Temperatur und der Feuchtigkeit auf den Brandebefall des Hafers durch gedeckten Haferbrand (Ustilago laevis (K. & S.) Mag.). (On the influence of temperature and humidity on the incidence of covered smut of oats (Ustilago laevis (K. & S.) Mag.).) Meld. Norges Landbrukshøiskole 2-3: 157-168. 1925. (Norwegian summary)

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

On oats, stem rust occurred in many widely scattered states but it was only severe in the form of small, local outbreaks in the vicinity of barberries and especially on late oats. A number of collaborators mentioned the fact that the late sown oats were most severely attacked. The disease was reported from Louisiana for the first time. In Pennsylvania it occurred chiefly in the northeastern part of the state where barberries are common. In North Dakota it was mentioned as being especially prevalent in the Red River Valley, and in Washington it was serious only in the Skagit Valley of the western part of the state.

For the most part much less than normal loss occurred. Exceptions to this are in the cases of Idaho and California where more than normal amounts were reported. In California, it was of much importance on the oat crop, ruining much of the oat hay and reducing the yield of grain, according to W. W. Mackie. Dry weather during the spring and summer months over the greater part of the country accounts for the reduced amount of infection. In the western states, however, including California, the season was wet, all months from April to September having precipitation above normal, which probably explains the abundance of the disease in California. The greatest losses outside of California were in Pennsylvania, Wisconsin, and the Dakotas. The estimated losses were California 2 per cent, Pennsylvania 1.5 per cent, Connecticut, Wisconsin, North Dakota, and South Dakota 1 per cent, Michigan and Iowa 0.5 per cent, and in nineteen other states reporting, a trace.

Dates of earliest observation:

Jan. 1	Texas	Grand View	July 10	Illinois	Rockford
May 1	Arizona	Maricopa Co.	July 23	Pennsylvania	Montrose
June 20	Minnesota	Hutchinson	Aug. 1	Connecticut	Westport

Concerning resistant varieties, R. S. Kirby of Pennsylvania reported that Richland, White Russian, and Heigira Rustproof were resistant while Burt, Silvermine, Victory, Cornellian, and Patterson were susceptible. Mackie mentioned that, in California, the only satisfactory variety found resistant is Richland 320A which is immune under California conditions. The U. S. Department of Agriculture has been testing varieties of oats for resistance for several years. In the spring of 1925, sixteen of these varieties were distributed to 51 cooperators for testing under different environmental

conditions. Among these promising selections were Minnesota No. 686, Minnesota No. 687, Victory, Minota X White Tartar, Richland, White Tartar, Hegira Rustproof.

Recent literature:

1. Dietz, S. M. The inheritance of resistance to Puccinia graminis avenae. (Abstract) Phytopath. 15: 54. 1925.

CROWN RUST CAUSED BY PUCCINIA CORONATA CDA.

Crown rust was generally much less prevalent than usual over the country as a whole. The only states reporting more than last year were Illinois, Wisconsin, North Dakota, and California. The dry spring and early summer undoubtedly accounts for the reduced infection in most areas. Regarding the weather factor, an observation by S. M. Dietz of Iowa is of interest. He found infection of Rhamnus lanceolata in southwestern Iowa to be nearly 100 per cent during April and May. It was almost impossible to find a leaf without several aecia and many of the bushes were so heavily infected that they appeared yellowish from a distance. However, when this area was revisited on May 26 most of the aecial material had dried up and although over three hundred oat fields and many wild grasses were inspected, no urediniospores were found prior to June 6, when a single uredinial sorus was found on oats in Warren County. Dietz says that the failure of oats and grasses to become infected was probably due to the extremely dry weather.

The percentage losses were highest in the southern states as usual, Florida, Louisiana, and California leading.

Table 89. Estimated reduction in yield due to crown rust as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
26	Florida	0.5	Pennsylvania, Texas
3	Louisiana, California	0.1	Georgia, Ohio
1	Connecticut, Wisconsin		

The results of a survey in Iowa and parts of Missouri and Minnesota by S. M. Dietz, mentioned above, have been reported (Plant Disease Reporter 9: 30-31, July 15, 1925). In the great majority of plantings of Rhamnus cathartica and R. lanceolata rust infection was found, and, if the weather conditions had been favorable heavy infection of oats undoubtedly would have occurred.

Dates of earliest appearance as reported were: January, Gainesville, Fla.; January 24, Harlingen, Texas; April 20, Baton Rouge, La.; April 23, Story County, Iowa (on Rhamnus); May 8, Nebraska (on Rhamnus); May 20, Wayne County, N. Y.; May 25, Amherst, Mass. (on Rhamnus); June 2, Brown County, Ill.; June 12, State College, Pa. (on Rhamnus); June 22, Clemson College, S. C., and Steele County, Minn.

Recent literature:

1. Dietz, S. M. Alternate hosts of Puccinia coronata Corda. (Abstract) Phytopath. 15: 54. Jan. 1925.

2. ---------- Alternate hosts of Puccinia coronata II. (Abstract) Phytopath. 16: 84. Jan. 1926.

3. ---------- The effect of the alternate hosts on physiologic forms. (Abstract) Phytopath. 16: 83. Jan. 1926.

BLAST (NON-PAR.)

More than the usual amounts of blast were noted in Tennessee, Arkansas, Illinois, and California and in addition, more than last year was reported from Iowa. Collaborators in other states mentioned it as being about as usual. Dry weather, which kept down many of the fungous diseases, might be expected to have the opposite effect on a disease such as blast, for under dry soil conditions it is natural to suppose that more of the disease might result. In Arkansas it was mentioned as being very important on winter oats, causing a reduction in yield of perhaps 7 per cent on the average, while spring oats were almost free. In Illinois, it was second to smut in importance, being especially severe in the central counties and causing an estimated loss for the state of about 1.7 per cent. Other losses reported were: 10 per cent, Montana; 7 per cent, Iowa; 5 per cent, Minnesota and Kansas; 1 per cent, Pennsylvania. Differences in varietal susceptibility were noted in Idaho.

HALO LEAF BLIGHT CAUSED BY BACTERIUM CORONAFACIENS ELLIOTT

Halo blight was reported as worse than usual in Illinois and Iowa. In each of these states the reduction in yield was estimated at 1 per cent. In Illinois it was said to be the most prevalent, conspicuous, and serious of the foliage diseases. California also reports more than ordinarily. All of the other states reporting mention it as being of the same prevalence as or less than usual. In general, it was of minor importance, only traces of loss being recorded except in the two states mentioned. Dates of earliest observation were: April 25, Harrodsburg, Ky.; May (early) Fayetteville, Ark.; May 2, Madison, Wis.; May 20, Silver Lake, Minn.; June 3, Scott County, Ill.; June 10, Houston, Del.; and June 22, Shippensburg, Pa.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Scab was of no economic importance on oats in 1925. It was only observed in and reported to the Survey from six states, namely; Pennsylvania,

Maryland, Tennessee, Wisconsin, Minnesota, and Iowa, and in these only traces were noted. The dates of earliest observation reported were July 4, Madison, Wis.; July 9, Steele County, Minnesota, and July 23, Montrose, Pa.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Only traces of anthracnose were observed in and reported to the Survey from four states, New York, Pennsylvania, Ohio, and Wisconsin. Twenty-one other states reported that it had not been observed or that no data were available concerning it.

OTHER DISEASES

Bacterial leaf blotch caused by Pseudomonas sp. This bacterial disease, which seems to be different from halo blight, was reported from Arkansas by H. R. Rosen as follows:

> "Very common on certain varieties, particularly on Fulghum and Swedish Select, but not doing any serious damage. Differs from halo blight in that the yellowish or brownish, irregular spots are not surrounded by halos. Artificial infections with the organism isolated from these spots also show no halos, while the halo blight organism, isolated by the writer, shows the typical halos on the same variety of oats. Will be glad to get material from other collaborators."

Bacterial stripe, cause undetermined. "Two or three blades found by A. G. Johnson on College Farm, showing stripes and bacterial exudate, May 9." (Barss, Oregon)

Powdery mildew caused by Erysiphe graminis DC. New York (trace).

Pink root caused by Fusarium sp. was common everywhere in California, according to Mackie, reducing the yield to a considerable extent. It causes death of seedlings and blasting of grain.

Leafspot caused by Helminthosporium sp., probably H. avenae Eidam was reported from New York (trace), and Pennsylvania (trace).

Speckled blotch caused by Leptosphaeria avenaria Weber, One specimen collected by W. H. Davis of Massachusetts, May 5.

Southern blight caused by Sclerotium rolfsii Sacc. This disease, which commonly does not attack the cereal crops, was reported from Mississippi by J. M. Wallace, who stated that it occurred in the cereal nursery at the Agricultural College where several plants were killed by the fungus.

Recent literature:

1. Clausen. Haferkrankheiten nichtparasitarer Natur. (Oat diseases of a non-parasitic nature.) Illus. Landw. Zeit. 45: 143. 1925.

Gray speck, yellow tip, soil acidity disease, and a

yellowish-brown discoloration caused by lack of potash are discussed.

2. Rives, L. Sur une maladie ocasionnelle de l'avoine. Jour. Agr. Prat. 89 (n. s., 44): 148. Aug. 22, 1925.
Asterocystis radicis.

C O R N

SMUT CAUSED BY USTILAGO ZEAE (BECKM.) UNG.

Probably more states reported on corn smut in 1925 than on any other cereal disease, in fact, practically all states sending in any plant disease reports mentioned the occurrence of corn smut. This illustrates further the fact that the disease occurs in all corn regions. Collaborators in some states mentioned that it was more common in some sections than in others. For instance, in Georgia it was mentioned as being most common in the southern counties. In Florida it was worse in the northern half, in Kansas it was more prevalent in the central and western parts, and in Colorado it seemed to be common in the eastern part of the state. The exact weather conditions influencing smut are somewhat uncertain. In general, the summer of 1925 was very dry, at least east of the Rocky Mountains, but in spite of that fact certain eastern states reported more smut than the average. Along the coast from New Jersey, through Delaware, Maryland and Virginia there were complaints of an unusual abundance of smut in corn, and in Indiana, Wisconsin, and Minnesota collaborators reported more than usual and more than last year; also in Colorado more was noted although the aggregate loss was slight, and in California where rainfall was above normal throughout the season, it was rated as of more importance than ordinarily.

Table 90. Estimated reduction in yield of corn because of smut as reported by collaborators, 1925.

Percentage loss	States reporting	Percentage loss	States reporting
5	Kansas	1	New Jersey, Virginia,
4	Iowa, North Dakota, Arizona		West Virginia, Florida, Michigan, South Dakota
3	Connecticut, Ohio		Tennessee, Utah, Maryland
2	New York, Pennsylvania, North Carolina, Minnesota	0.5	Delaware, Kentucky

Collaborators in two states mentioned the type of injury that was most common. In Wisconsin it was mostly on the ear and tassel, according to Vaughan; in Iowa, joints, tassel and ears were mentioned as being affected. Other observations of interest were reported. In Maine, according to Folsom, the disease is usually rare, but this season several specimens were received indicating increased prevalence. In South Carolina as high as 25 per cent infection was estimated by one grower in his field and in Oklahoma as high as 40 per cent infection was noted on old corn land. In Michigan sweet corn seemed to show less of the disease than usual and in early planted field corn there was also less. In Wisconsin more smut was noted on sweet than on field corn. In Nebraska, collaborators reported smut as very common and becoming worse.

Considerable work has been reported recently indicating success in breeding and selection for resistance of corn to smut. However, this problem is a complicated one for, as is pointed out by Stakman and Christensen (5), there are probably several physiological forms of smut which will react differently; and also as mentioned by Fleischmann, hard, early maturing corns are less susceptible than soft, late ones and environmental factors which influence hardness and earliness will influence also the amount of smut infection. He points out that fertilizers are important in this connection and states that although the tendency to smut is apparently hereditary in character, the factors involved are very complex.

Recent literature:

1. Fleischmann, R. Ist Neigung zu Maisbrand erblich und Immunitätszüchtung hierbei aussichtsreich? Deut. Landw. Presse. 52: 13-14. Jan. 10, 1925.

2. Garber, R. J., and K. S. Quisenberry. Breeding corn for resistance to smut. Jour. Amer. Soc. Agron. 17: 132-140. 1925.

3. Immer, F. R., and J. J. Christensen. The reaction of selfed lines and crosses of maize to Ustilago zeae. Phytopath. 15: 699-707. Nov. 1925.

4. Potter, Alden A., and Lee E. Melchers. Study of the life history and ecologic relations of the smut of maize. Jour. Agr. Res. 30: 161-173. 1925.

5. Stakman, E. C., and J. J. Christensen. Physiologic specialization of Ustilago zeae and Puccinia sorghi and their relation to corn improvement. (Abstract) Phytopath. 16: 84. Jan. 1926.

LEAF RUST CAUSED BY PUCCINIA SORGHI SCHW.

More leaf rust than usual was reported in 1925 from North Carolina, Arkansas, Michigan, and Minnesota. Other states reporting mentioned that it was of the same prevalence, or less than usual. It occurred generally east of the Great Plains, but states west of Colorado reported it.

Losses as reported by collaborators were: 2 per cent, North Carolina and Iowa, 0.1 per cent, Georgia, and traces from a large number of other states. It will be noted, therefore, that as a corn disease rust was of decidedly minor importance.

In Michigan it was mentioned as being severe on late plantings, especially of sweet corn. The average loss for the state, however, was only a trace.

Dates of earliest appearance as reported by collaborators were: June 14, Decatur County, Iowa; July 10, Georgia; July 24, Pike County, Illinois; July 27, University Farm, St. Paul, Minnesota; September 21, Linden, Pennsylvania.

An interesting observation is that of G. W. Fant of North Carolina who reports as follows:

> "Some of the cereal diseases were a little more prevalent than usual. Among these was corn rust produced by Puccinia sorghi which was quite common during the past summer. This disease was of greatest prevalence in eastern North Carolina, particularly where soybeans grown with corn tended to increase the humidity near the ground by shading."

In Iowa, M. A. Smith (1) found the alternate host of this rust, Oxalis corniculata, heavily infected. The earliest infection he observed was on April 28 and the latest on June 19. He has also conducted and reported on trials with the germination of spores of different ages and subjected to various humidities.

Recent literature:

1. Smith, M. A. Infection and spore germination studies with Puccinia sorghi. (Abstract) Phytopath. 16: 69. Jan. 1926.

DIPLODIA EAR ROT

Owing to the dry season Diplodia was less conspicuous throughout the corn belt than usual. Of the twenty-three states that reported it none mentioned it as being more prevalent than normal and only five mentioned it as being of even average prevalence. The remainder reported less. The latter part of the season during September and October was wet in some states, resulting in some late infection. Estimates of losses were: 3 per cent, Virginia, Georgia and Indiana; 2 per cent, Maryland, North Carolina and Iowa; 1 per cent, Delaware, South Dakota and California; 0.5 per cent, Illinois; and 0.3 per cent, Pennsylvania.

Koehler of Illinois reports percentages of Diplodia-infected ears as compared with those infected with Fusarium and Gibberella, as determined by counts of 660 bushels harvested from the experimental plots at Urbana. The percentages and his statement are as follows:

> "Attacked by Diplodia zeae 8.53 per cent; attacked by Fusarium moniliforme 2.68 per cent; and attacked by Gibberella saubinetii 0.07 per cent. When more than one

fungus occurred on an ear it was classed according to the one that seemed to be doing the most damage. An ear was classed as infected when 6 or more kernels showed evidence of rot. This, of course, only includes the direct rots and not the seed infections which only become visible on the germinator. Infection with G. saubinetii is slight this year while last year it was nearly equal with the amount of Diplodia infection."

Another note of interest is that of Manns and Adams (6) of Delaware who found that old corn from the 1922 crop kept stored in the laboratory and tested after it was two or three years old showed a reduction in amount of Diplodia and Gibberella.

A noteworthy contribution to the practical solution of the ear rot and root rot problem is that on seed treatments of sweet and field corn as reported by Holbert, Reddy, and Koehler (4) and by Reddy, Holbert, and Erwin (5) who, using various organic mercury compounds, have succeeded in greatly increasing the yield from seed infected with Diplodia and other organisms.

Recent literature:

1. Durrell, L. W. A preliminary study of fungous action as the cause of down corn. Phytopath. 15: 146-154. March 1925.

2. Edgerton, C. W., and A. F. Kidder. Fungous infection of seed corn kernels and the importance of germination tests. Louisiana Agr. Exp. Sta. Bul. 193: 1-24. 1925.

3. Holbert, J. W., W. L. Burlison, B. Koehler, C. M. Woodworth, and G. H. Dungan. Corn root, stalk, and ear rot diseases, and their control thru seed selection and breeding. Illinois Agr. Exp. Sta. Bul. 255 (abridged): 1-99. 1925.

4. ---------- Chas. S. Reddy, and Benjamin Koehler. Seed treatments for the control of certain diseases of dent corn. (Abstract) Phytopath. 16: 82-83. Jan. 1926.

5. Reddy, C. S., J. R. Holbert, and A. T. Erwin. Sweet corn seed treatment in 1925. (Abstract) Phytopath. 16: 65. Jan. 1926.

6. Manns, T. F., and J. F. Adams. (Report of) Department of plant pathology and soil bacteriology. Delaware Agr. Exp. Sta. Bul. 139: 24-29. 1925.

ROOT AND STALK ROTS CAUSED BY GIBBERELLA SPP. AND FUSARIUM SPP.

These diseases were reported about as usual. More than the average however, was reported from Michigan and California, while less than the average was reported from New York, West Virginia, Kentucky and Ohio. The following are some of the reports received from collaborators:

Maryland: Some resistance to the disease has been developed during the past five years through selection of ears free from internal cob-discoloration. (Jehle & Temple)

Virginia: Death of corn in well defined areas, evidently due to soil conditions, was more prevalent than usual. (Fromme & Godkin)

Kentucky: Because of excellent growing conditions up to tasseling time, root injury was less conspicuous than usual. (Valleau)

Georgia: Less serious in southern Georgia than in 1924. Most common in fields showing lack of sufficient fertilizer. One field in Lowndes County, July 23, showed 90 per cent of plants "down" after a wind storm due to small root system severely rotted. (Boyd)

In some fields that would normally produce 50 to 60 bushels to the acre the yield was cut down to 10. It is impossible to tell how much was due to dry weather or if the limiting factor was the Fusarium. (Miller)

Ohio: Much less in evidence in Ohio this year than normal. Particularly in fields where attention has been given to maintenance of fertility and the selection of seed corn, root rot is hard to find. (Thomas)

Illinois: Field examinations, incompletely compiled, indicate an apparent infection of 14 to 18 per cent with an apparent loss of 5 to 6 per cent. (Tehon)

Michigan: Fusarium root rots were generally reported this season in excess of average. High temperatures of June, July, and August favorable for development. Well fertilized fields from selected seed not damaged. (Nelson)

Kansas: Gibberella sp. absent in state. Fusarium spp. (especially moniliforme) most common. Diplodia, Basisporium, Rhizopus, and Penicillium are other organisms found. Soil acidity problems and metal injury are factors. The problem is complex and no single factor can be said to be responsible. (Melchers)

Percentage losses as estimated by collaborators were as follows: 10-Kansas; 5 to 10 - South Dakota; 5 - Indiana, Tennessee; 4 - Virginia; 3 - Pennsylvania, North Carolina, Wisconsin; 2 - West Virginia, Georgia; 1.5 - Delaware; 1 - Michigan and Minnesota.

The work in Delaware, which showed a reduction in Gibberella infection in old seed from the 1922 crop, has been mentioned under the heading of Diplodia. In Wisconsin (8) seed corn gathered before frost and artificially dried to a moisture content of 12 per cent was said to give a perfect stand free from root rot, as compared with a 40 per cent stand from uncured crib corn.

Recent literature:

1. Clinton, G. P. Report of the Department of Botany, Connecticut Agr. Exp. Sta. Bul. 264: 207-210. 1925.

2. Cooper, Thomas. Corn root-rot studies. Kentucky Agr. Exp. Sta. Ann. Rept. 37 (1924): 32-33. 1925.

3. Durrell, L. W. A preliminary study of fungous action as the cause of down corn. Phytopath. 15: 146-154. 1925.

4. Edgerton, C. W. and A. F. Kidder. Fungous infection of seed corn kernels and the importance of germination tests. Louisiana Agr. Exp. Sta. Bul. 193: 1-24. 1925.

5. Hoffer, G. N., and J. F. Trost. Influence of balanced nutrient supply on susceptibility of corn plants to Gibberella saubinetii (Mont.) Sacc. (Abstract) Phytopath. 15: 59-60. Jan. 1925.

6. Holbert, J. R., W. L. Burlison, B. Koehler, C. M. Woodworth, and G. H. Dungan. Corn root, stalk, and ear rot diseases, and their control thru seed selection and breeding. Illinois Agr. Exp. Sta. Bul. 255 (abridged): 1-99. 1925.

7. Koehler, B., G. H. Dungan, and J. R. Holbert. Factors influencing lodging in corn. Illinois Agr. Exp. Sta. Bul. 266: 311-371. 1925.

8. Russell, H. L., F. B. Morrison, and W. H. Ebling. Corn root rot. In New pages in farm progress. Wisconsin Agr. Exp. Sta. Bul. 373 (Ann. Rept. Director 1923/24): 13. April 1925.

EAR ROT CAUSED BY FUSARIUM SPP.

Twenty-two states, all east of the Great Plains except California, reported Fusarium ear rot. Five states, Delaware, Maryland, Tennessee, Arkansas, and Indiana reported association of the ear rot with ear worm injury. Apparently the ear worm was very active with the result that subsequent rot was prominent. Collaborators reported the following losses from this cause; 4 per cent, Pennsylvania and North Carolina; 2 per cent, Georgia; 1.5 per cent, Illinois; 1 per cent, Maryland and Virginia; 0.5 per cent, Delaware and Indiana.

In California the disease was unusually severe. No estimate of reduction for the state as a whole is given but W. T. Horne reported a large amount of mold of ears and single kernels probably caused by Fusarium moniliforme. He stated that on 40,000 acres a loss of 30 per cent was estimated.

In connection with their annual report, collaborators were asked to give information on the extent to which the Maryland method of selecting seed corn, by cutting off the butts and tips, was being used or tested.

Collaborators in twenty-seven states reported, and twenty-three of them stated that the method was not used. In four, however - Maryland, Pennsylvania, Georgia, and Colorado - the method was used or tested to some extent. Replies to the questionnaire, aside from merely negative answers, are as follows:

Pennsylvania: Yes. We tried out the Maryland method in three demonstration plots. The results were conflicting and all apparently within the range of probable error. As for example in one plot:

	Yield (bushels of dry shelled corn)	
	Total yield	Yield, large disease-free ears
From 200 ears selected from:		
a bin for seed.		
4 with cleanest cob	84.4	47.9
4 with cobs having greatest discoloration	83.4	48.7

(Kirby)

Maryland: This method is being adopted by the grower rather generally. More than 150 tests and demonstrations have been made. From these there has been a rapid spread of influence. (Temple)

Virginia: The Maryland method of selecting seed corn has not been used so far as I know. We have used the improved rag-doll germinator extensively. Results are hard to measure but farmers are generally well pleased. (Fromme)

Georgia: (southern): The method is commonly used among growers in general throughout the southern counties. (Boyd)

Illinois: The Maryland method of selecting seed corn has not been used in this state. There are some varieties of corn in this state with which it probably could be used, but by far the greatest amount of corn in this state is of the Yellow Dent type which has a natural internal cob discoloration. In such cobs, it is hardly possible to detect any discoloration due to disease as one could in a cob having a whiter interior. (Tehon)

Nebraska: The universal practice in Nebraska is to shell off the tips and butts, in order to have more uniform size seed and avoid mechanical difficulties. No differences in germination. (Goss)

Colorado: Removal of butt and tip of seed corn is recommended and practiced to some extent. (Durrell)

BACTERIAL WILT CAUSED BY APLANOBACTER STEWARTII (EFS.) MCC.

New York, Maryland, Virginia, West Virginia, Ohio, Indiana, Illinois, and Oklahoma reported this disease in 1925. It was, in general, of only very slight importance and was reported mostly on sweet corn, particularly the Golden Bantam variety. In Maryland, collaborators estimated a 10 per cent infection of Golden Bantam. In Ohio the disease seemed to be more prevalent on field corn than has been the case in recent years. It was first observed August 13 in Washington County, Illinois, and August 17 in Tompkins County, New York.

BROWNSPOT CAUSED BY PHYSODERMA ZEAE-MAYDIS SHAW.

Slight amounts of this disease were reported from states along the Atlantic seaboard from Maryland to Florida, and in Louisiana, Arkansas, Illinois, and Kansas. It was also found and reported by W. H. Weston in the Provinces of Santa Clara and Mantanzas, Cuba. The losses were very slight, being less than 1 per cent in all states. In Florida it was estimated that it infected 2 per cent of the plants in half of the corn fields.

OTHER DISEASES

Head smut caused by Sorosporium reilianum (Kuehn) McAlp. was reported from Idaho, Washington, and California. In Clearwater and Lewis Counties, Idaho, several fields showed the smut. In Washington it was present to a limited extent around Pullman, and in California a trace was observed at Davis.

Downy mildew caused by Sclerospora graminicola (Sacc.) Schroet. The first record of Sclerospora graminicola on corn in this country came from Iowa and has been reported in the Plant Disease Reporter (9: 65. August 15, 1925) and by Melhus and Van Haltern (8, 9). The disease is more noticeable on corn in very early stages and so should be looked for early in the season.

Leaf blight caused by Helminthosporium turcicum Pass. Reported from Maryland, Illinois, and Porto Rico.

Cob rot caused by Basisporium gallarum Moll. was reported from Minnesota (University Farm, one variety had 30 per cent infection, estimated loss for the state between 2 and 3 per cent), and Iowa (more than usual, important, occurring over the whole state and causing a loss estimated at 8 per cent). See references 3 and 4.

Black bundle caused by Cephalosporium acremonium Cda. was reported from Pennsylvania by R. S. Kirby.

Green smut caused by Ustilaginoidea sp. The first report of this fungus on corn has been received by the Plant Disease Survey from C. W. Edgerton from Louisiana. The report was accompanied by a specimen collected September 2. It is not unlikely that it is the same fungus that occurs on rice but before that can be ascertained cross inoculations will be necessary.

Bacterial stalkrot caused by Bacterium dissolvens Rosen. According to

H. R. Rosen, this disease appeared in epidemic form in localized areas in parts of Arkansas. It was very severe during the latter part of June and early July in Independence County. For the state as a whole, much more bacterial stalk rot was reported than usual.

Bacterial diseases (undet.) A bacterial stalk rot thought to be the same as that described by Rosen of Arkansas was reported from Arizona, where it has been observed for the past two years. The disease was locally destructive. In Ohio a bacterial wilt is reported, similar to but apparently distinct from, Aplanobacter stewartii. The disease is being studied in Ohio. A bacterial leafspot was reported from Texas and Idaho (noted in gardens, occurring quite generally).

Kernel mold caused by Aspergillus sp. was reported from Florida and Oklahoma. In the latter state as high as 42 per cent of the ears in some fields were injured.

Leaf and sheath spots caused by various organisms. Considerable spotting of sheaths occurred in Arkansas. (Dept. Plant Path.)

Mosaic caused some damage in Louisiana and occurred in about the normal amounts, according to collaborators.

Recent literature:

1. Drechsler, C. Leaf spot of maize, a disease distinct from leafblight. (Abstract) Phytopath. 15: 47. 1925.

2. ---------- Leafspot of maize caused by Ophiobolus heterostrophus n. sp. the ascigerous stage of a Helminthosporium exhibiting bipolar germination. Jour. Agr. Res. 31: 701-726. Oct. 15, 1925.

3. Durrell, L. W. A preliminary study of fungous action as the cause of down corn. Phytopath. 15: 146-154. 1925.

4. ---------- Basisporium dry rot of corn. Iowa Agr. Exp. Sta. Res. Bul. 84: 138-160. May 1925.

5. Edgerton, C. W., and A. F. Kidder. Fungous infection of seed corn kernels and the importance of germination tests. Louisiana Agr. Exp. Sta. Bul. 193: 1-24. 1925.

6. Johann, Helen, J. R. Holbert, and James G. Dickson. A Pythium seedling blight and root rot of dent corn. (Abstract) Phytopath. 16: 85. Jan. 1926.

7. Koehler, B. Diseases in Illinois seed corn as found in the fifth utility corn show. Illinois Agr. Exp. Sta. Circ. 299: 1-8. July 1925.

8. Melhus, I. E. and F. Van Haltern. Sclerospora on corn in America. Phytopath. 15: 720-721. Nov. 1925.

9. ---------- Sclerospora graminicola on corn. (Abstract) Phytopath. 16: 85-86. Jan. 1926.

10. Storey, H. H. The transmission of streak disease of maize by the leaf hopper Balclutha mbila Naude. Ann. Appl. Biol. 12: 422-439. Nov. 1925.

11. Winter, F. L. The effectiveness of seed corn selection based on ear characters. Jour. Amer. Soc. Agron. 17: 113-118. Feb. 1925.

R I C E

Blast, Piricularia grisea (Cke.) Sacc. Florida, Louisiana, Texas, Arkansas, and Porto Rico reported blast. In Florida it was quite common wherever rice was grown. In Arkansas more than usual occurred, it was of some importance, and was associated with late rice and cool wet weather.

Straighthead (non-par.) was reported from Texas and Arkansas. It was said to be prevalent in Texas, and from Arkansas, V. H. Young reported as follows:

> "More straighthead present than in either of the past two years. Not necessarily on new land. Often without the typical dark green color generally associated with typical straighthead."

Collaborators in Louisiana stated that although the disease had not actually been observed it undoubtedly was present.

Stemrot, Sclerotium oryzae Catt. This disease occurred in Louisiana and Arkansas. In the latter state it was important, occurring in more than the usual amounts and causing a reduction in yield for the state estimated at about 2 per cent. It was rather widespread and all commercial varieties were attacked. V. H. Young (3) has recently reported his observations on this disease.

Black smut, Tilletia horrida Tak. This smut was not reported by collaborators from any of the rice states. Negative reports were received from South Carolina, Georgia, Louisiana, Texas, Arkansas, and California.

Blight, Helminthosporium oryzae Van Breda de Haan. This disease was collected in Florida and Porto Rico. In Florida it seemed to be doing considerable damage to seedling plants in several small rice fields, according to Weber. A spotting of leaves caused by Helminthosporium sp. was common but of little importance in Arkansas.

Speckled blotch, Septoria oryzae Catt., was reported to the Survey for the first time from any state. No specimen accompanied the report. G. F. Weber found it occurring on glumes in a single field in Florida. This disease is known in Italy, Brazil, China, and Japan.

Recent literature on rice diseases:

1. Sundararaman, S. Longevity of paddy Piricularia. Year Book Madras Agr. Dept. 1924: 9. 1925.

2. Winkler, H. Die Schädlinge und Krankheiten des Reises. Tropenpfl. 28: 174-189, 242-255. July-Aug., Sept.-Oct. 1925.

3. Young, V. H. Observations on the stem rot of rice caused by Sclerotium oryzae Catt. (Abstract) Phytopath. 16: 86. Jan. 1926.

F L A X

WILT CAUSED BY FUSARIUM LINI BOLLEY

Wilt was reported from Wisconsin, Minnesota, North Dakota, South Dakota, and Montana. No reports of it were received from collaborators in Michigan. In North and South Dakota and Montana it was of some importance. The percentage losses estimated as due to wilt were North Dakota 10, South Dakota 2, Montana 3, and Minnesota 1.5. The reduced amount of the disease in Minnesota and North Dakota is attributed by collaborators to cool weather; also the fact that resistant varieties are coming into general use in Minnesota probably explains to a considerable extent the freedom from wilt in 1925.

RUST CAUSED BY MELAMPSORA LINI (SCHUM.) DESM.

Rust was prevalent in about the same amount as or less than last year and was reported from Michigan, Wisconsin, Minnesota, North Dakota, and Oregon. From the last named state the disease was reported to the Survey for the first time. For the most part, only traces of loss resulted, but in Minnesota 0.5 per cent, and in North Dakota 2 per cent reductions in yield were estimated. It was first observed June 20 in Brownton, Minn.; July 4, Fargo, N. Dak., and July 20, Madison, Wis.

Recent literature:

1. Hart, Helen. Factors affecting the development of Melampsora lini (Pers.) Desm. (Abstract) Phytopath. 15: 53-54. Jan. 1925.

2. Henry, A. W. Inheritance of immunity from Melampsora lini. (Abstract) Phytopath. 16: 87. Jan. 1926.

3. ---------- and E. C. Stakman. The control of flax rust. (Abstract) Phytopath. 15: 53. 1925.

CANKER (NON-PAR.)

Canker was reported from North Dakota, South Dakota, Montana, and Oregon. In North Dakota it was an important disease causing a loss estimated at 3 per cent for the state, while in Montana a 2 per cent loss was estimated. In Oregon it was serious in some fields, lesions occurring at the bases of stems in mature plants as well as young ones. Cool, moist weather in Oregon, extending well into June, followed by very hot weather during the last of June with a maximum temperature of over 100° F. in most sections of the Willamette Valley favored canker. According to Barss it occurred mostly in late planted fields and on heavy soils. Of 49 fields, containing 650 acres visited, 35 per cent had some heat canker.

PASMO CAUSED BY PHLYCTAENA LINICOLA SPEG.

Minnesota and South Dakota reported pasmo. Less than last year was noted in Minnesota but more, apparently, occurred in North Dakota.

Reference:

1. Baez, J. R. La peste del lino llamada "pasmo." Nuestra Tierra. Buenos Aires. 8: 105-106. April 1925.

OTHER DISEASES

Brown stem (non-par.) This disease, probably due to heat or excess transpiration, or poor root development, was reported by H. P. Barss of Oregon as being of considerable importance in some fields. It caused dark brown or purplish stem tips with poorly developed fiber to 6 or 8 inches or more from the tips, and failure to mature seed.

Yellows (undet.) Yellowing and stunting of plants in the seedling stage was reported by collaborators from Minnesota as more common than last year. It occurred in both high and low parts of fields and was thought possibly to be associated with alkaline soil.

Browning disease caused by Polyspora lini Lafferty. According to Henry (1) this disease has been present in North America at least since 1920. It was found in the field plots at Saskatoon, Canada in 1920 and 1923, and in August 1925 in Michigan. This is the first report of occurrence in the United States as far as the Plant Disease Survey has record.

Reference:

1. Henry, A. W. Browning disease of flax in North America. Phytopath. 15: 807-808. Dec. 1925.

COVERED KERNEL SMUT CAUSED BY SPHACELOTHECA SORGHI (LK.) CLINT.

Reports of the occurrence of this smut were received from South Carolina, Louisiana, Porto Rico, Texas, Minnesota, Kansas, and Colorado. In the last three states it was reported as being prevalent and of considerable importance. In Kansas it was estimated by L. E. Melchers that the loss for the state would probably be 10 per cent of the crop. In that state experiments have been conducted on control by means of copper carbonate with very successful results. Concerning it Melchers writes:

> "Experimental work in the Department of Botany and Plant Pathology of the Kansas Agricultural Experiment Station the past three years has definitely proved the value of copper carbonate for the control of sorghum kernel smut. This is an important finding since it has already been largely adopted over the state. The old formaldehyde treatment was not greatly put into use on account of its being a wet treatment. The control by copper carbonate will mean a million dollars saving each year in Kansas."

Last year a kernel smut attacking milo, feterita, and hegari was reported. More reports of the occurrence of this fungus on these hosts were received during 1925 and indications are that it is spreading. Because of the attack on those varieties, immune to the ordinary kernel smut, it becomes necessary to treat the seed of all sorghum before planting. Indications are that the new strain of smut may be effectively controlled with the copper carbonate dust seed treatment. The problem of breeding for resistant varieties is complicated by the presence of the new form. A report concerning it was given by Tisdale, Melchers, and Clemmer (3) at the Kansas City meeting.

Recent literature:

1. Melchers, L. E. Control of sorghum kernel smut by the copper carbonate method. Kansas Agr. Col., Div. Col. Exten. Leaflet 224: 2 pp. 1925.

2. Reed, G. M., and L. E. Melchers. Sorghum smuts and varietal resistance in sorghums. U. S. Dept. Agr. Bul. 1284: 1-56. Aug. 1925.

3. Tisdale, W. H., L. E. Melchers, and H. J. Clemmer. A strain of sorghum kernel smut which infects milo and hegari. (Abstract) Phytopath. 16: 85. Jan. 1926.

LOOSE KERNEL SMUT CAUSED BY SPHACELOTHECA CRUENTA (KUEHN) POTTER

Loose kernel smut was reported this year only from Texas although it doubtless occurred in numerous other states where sorghum is grown. In

Texas it was said to be prevalent. Faris and Reed (1) have reported successful infection as a result of local inoculations in various parts of plants in different stages of growth.

Reference:

1. Faris, James A., and George M. Reed. Modes of infection of sorghum by loose kernel smut. Mycologia 17: 51-67. 1925.

HEAD SMUT CAUSED BY SOROSPORIUM REILIANUM (KUEHN) MCALP.

Head smut was reported from Minnesota, Kansas, and Texas. In Kansas, Melchers stated that it was never abundant but this year there was even less than usual. Marked variation in susceptibility of different strains was noted in Minnesota.

OTHER DISEASES

Rust caused by Puccinia purpurea Cke. Florida, Louisiana, and Porto Rico reported rust. In Florida it was found infecting the host wherever grown but was not serious.

Anthracnose caused by Colletotrichum sp., probably Colletotrichum lineola Cda., Florida (common but of little importance).

Leafspot caused by Helminthosporium turcicum Pass. Florida (caused considerable firing of lower leaves in a large number of fields).

Stripe caused by Bacterium andropogoni EFS. Kansas (Occurred rather commonly over the state but damage not great; less common than some of the other leaf discolorations and spots), Texas, and Minnesota. In the two last-named states it was reported under the name of Bacillus sorghi.

DISEASES OF FORAGE CROPS

ALFALFA

LEAFSPOT CAUSED BY PSEUDOPEZIZA MEDICAGINIS (LIB.) SACC.

This disease was reported from seventeen states scattered all over the country from the East to the West Coast. In general, it was of the same prevalence as or less than normal, Georgia being the only state that mentioned

more than usual. A number of collaborators attribute the reduced amounts to the dry season. No notes of especial importance concerning this disease were received.

YELLOW LEAF BLOTCH CAUSED BY PYRENOPEZIZA MEDICAGINIS FCKL.

Yellow leaf blotch was reported by collaborators in New York, Georgia, Iowa, Nebraska, Kansas, Idaho, Washington, and Oregon. In addition, it was collected by J. L. Weimer in Maryland, Kentucky, Alabama, Ohio, and Indiana. In Nebraska and Idaho it was more common and destructive than the Pseudopeziza leaf spot. In none of the states, however, with the exception of Georgia, did the damage amount to much. In Georgia it caused defoliation in the majority of alfalfa fields and was considered a very important disease. An estimate of 5 per cent loss for the state was made by J. H. Miller of the College of Agriculture. He wrote that the disease affected the stems of alfalfa and that considerable varietal differences in varietal susceptibility were noted.

DOWNY MILDEW CAUSED BY PERONOSPORA TRIFOLIORUM D BY.

Downy mildew was reported to the Survey from Kentucky, Louisiana, Minnesota, Iowa, Colorado, Arizona, and the Pacific Northwest. It was mentioned as occurring mostly on the first cutting in the majority of states and dates of earliest appearance were: Louisiana, March 20; Arizona, April; Oregon, April 7; Colorado, June; Minnesota, July 10.

Patel (1) exposed 31 species and 16 genera of legumes to infection by this fungus and out of these only two, Medicago sativa and M. lupulina, became infected. He also studied the overwintering and temperature relations of the fungus as well as conditions necessary for germination.

Reference:

1. Patel, M. K. Study of Peronospora trifoliorum DeBy. on species of Leguminosae. (Abstract) Phytopath. 16: 72. Jan. 1926.

NEMATODE, TYLENCHUS DIPSACI (KUEHN) BAST.

This nematode was reported from two new states, Illinois and Nebraska, these reports coming from the Office of Nematology of the Bureau of Plant Industry where specimens were received. This brings the total number of states in which the organism has been found parasitizing alfalfa up to ten, namely: Illinois, Nebraska, Colorado, New Mexico, Arizona, Utah, Idaho, Washington, Oregon, and California. Judging from the reports received for 1925, it would seem that this disease is not proving to be as important as it was feared it might. In several of the states the disease appears to be confined to a few fields of relatively

small area, while in others, such as Colorado, the disease is widespread but apparently has been present for as long a period as 25 years and even now does not seem to be a very serious factor. In fact, Thorne (2) states, concerning its occurrence in Colorado and Utah, that, "It is not a serious menace to the alfalfa industry. Fields are rarely appreciably injured until the fourth or fifth year and under proper rotation system this is long enough to allow alfalfa to remain at one time." The reason the disease was found so widespread in Colorado in 1924 was the special survey which was conducted for it and for the general dying of alfalfa, which was causing great concern to farmers and which was found not to be due to the nematode but to another cause (bacterial crown or root rot).

Recent literature:

1. Gillette, C. P. Alfalfa nematode investigations. In Sixteenth Ann. Rept. State Entomologist Colorado, 1924. Office Colorado State Entomol. Circ. 47: 58-60. June 1925.

2. Noble, R. J. A disease affecting lucerne. Agr. Gaz. New South Wales 36: 827. Nov. 1925.

3. Thorne, Gerald. Report of the outbreak of Tylenchus dipsaci Kuhn in Colorado and Utah, in 1924. In Sixteenth Ann. Rept. State Entomologist Colorado, 1924. Office Colorado State Entomol. Circ. 47: 61-70. June 1925.

BACTERIAL BLIGHT CAUSED BY BACTERIUM MEDICAGINIS (SACK.) EFS.

Collaborators reported bacterial blight from Kansas, Utah, Idaho, and Oregon. J. L. Weimer, while inspecting alfalfa fields in the middle west, collected it in the additional states of Nebraska, Iowa, Illinois, Indiana, and Ohio. In Idaho it was said to be much more common than usual, causing considerable injury in many parts of the state. In Oregon it was said/to be very important but widely scattered. B. L. Richards of Utah reports as follows concerning it:

> "The cool wet season has greatly intensified the severity of stem blight of alfalfa. The disease occurred generally on the first crop throughout the entire state. Especially severe in Salt Lake, Cache, and Boxelder Counties. Fields have been observed which show a decreased yield of from 50 to 60 per cent. A high average loss will result for the entire state."

BACTERIAL CROWN AND ROOT ROT CAUSED BY APLANOBACTER INSIDIOSUM MCCULLOCH

This is a new disease which has been reported during the year. A note concerning it has been published by Jones (2) and the organism has been

described by McCulloch (3). What seems to be the same disease has been reported on by Durrell and Sackett (1) and by Sackett (4). In the Plant Disease Reporter (9: 28, 53, 110. 1925.) the disease is mentioned as occurring in Alabama, Mississippi, Indiana, Illinois, Iowa, Nebraska, Kansas, and Colorado. It has also been reported to the Plant Disease Survey from the additional states of New Jersey, Pennsylvania, Michigan, and Missouri. Root rots of undetermined causes which may possibly be the same as this occurred in Minnesota and Oklahoma also, according to collaborators.

Plantsaffected with bacterial crown and root rot die in groups, causing dead areas which increase in size from year to year. The foliage is sickly and dwarfed, and the tap roots show a brown discoloration under the bark. In advanced cases the bark slips from the woody core, which appears yellow on the outside instead of white. Masses of bacteria fill a large number of the outermost vessels of the wood. A yellowish substance is also present in the xylem vessels.

Work on this disease and its control is being done in a number of states, especially at Madison, Wis., and at Fort Collins, Colo., and in the U. S. Department of Agriculture.

Recent literature:

1. Durrell, L. W., and W. G. Sackett. A root rot of alfalfa. Science n. s. 62: 82-83. July 24, 1925.

2. Jones, Fred Reuel. A new bacterial disease of alfalfa. Phytopath. 15: 243-244. April 1925.

3. McCulloch, Lucia. Aplanobacter insidiosum n. sp., the cause of an alfalfa disease. Phytopath. 15: 496-497. Aug. 1925.

4. Sackett, W. G. Crown or root rot of alfalfa. Through the Leaves 13: 213-214. May 1925.

OTHER DISEASES

Leafspot, Cercospora medicaginis Ell. & Ev. Reported from Georgia, Alabama, Mississippi, and Texas. In Georgia it was reported by J. H. Miller as being found in all alfalfa fields examined in late summer but that it occurred in much less amounts than in previous years owing to the dry season. It was not especially important.

Rust, Uromyces medicaginis Pass. Georgia, Alabama, Mississippi, Louisiana, Texas, Indiana, New Mexico, and Arizona reported rust. In general it did not seem to be of much importance although in Louisiana it was said to cause some loss and in Indiana it was serious in the late fall. In New Mexico, more than last year was noted and it was of some importance, causing considerable loss of leaves. In Arizona it seemed to be rare except in a few isolated places such as along banks of ditches.

Crown wart, Urophlyctis alfalfae (Lagh.) Magn. was reported to the Survey for the first time from Indiana by J. L. Weimer, who collected it at Madison, Ind., June 12. This is not only the only report from Indiana but also the first from east of the Rocky Mountains. A note has been published

concerning it (6). In Oregon collaborators reported crown wart as probably general in the western part of the state, where alfalfa has been established for some time, and undoubtedly a factor in the thinning out of the stand and ultimate failure of the field. The damage that is done is not generally realized by growers.

Root rot, Sclerotinia trifoliorum Eriks. Idaho (only one report of it received this year), and Oregon (less than usual, general in western part of state, first observed April 7, Lane County).

Root rot, Ozonium omnivorum Shear. Texas (very prevalent, 6 per cent loss, especially in Rio Grande Valley and in western Texas under irrigation), Arizona (occurred in southern half of state and caused estimated reduction in yield of 3 per cent. The conidial stage was reported very abundant in the alfalfa fields of Verde Valley).

Stem rot, Sclerotium rolfsii Sacc. Collected at Columbus, Miss., August 4 by J. L. Weimer. This is the first report to the Survey from Mississippi, on this host.

Root rot attributed to Fusarium sp. occurred in Oklahoma (common in fields in the Red River section), Missouri (very destructive in small areas in Boone County), and Idaho (important in isolated cases).

Violet rootrot, Rhizoctonia crocorum (Pers.) DC. Iowa.

Anthracnose, Colletotrichum trifolii Bain, was reported from Mississippi by D. C. Neal, who stated that the disease was undoubtedly held in check this season by the very dry weather. In some years this is a serious disease in Mississippi. Anthracnose was also collected in Kansas by J. L. Weimer in the course of his alfalfa disease survey.

Dodder, Cuscuta sp. Texas, New Mexico, Arizona, and Washington reported trouble with dodder in 1925. In New Mexico it was said to be of considerable importance, smothering the vines and reducing the yield to the extent of 4 per cent for the state. Control measures are being used in an effort to reduce it. Interesting work along the lines of freeing alfalfa seed from dodder by means of dry heat is reported by Staker (2).

Leafspot, Ascochyta imperfecta Pk. Collected in Maryland and Kansas by J. L. Weimer.

Leafspot caused by Macrosporium sp. Louisiana.

Rootknot, Heterodera radicicola (Greef) Muell. (Caconema radicicola (Greef) Cobb). Texas (important where the hairy Peruvian variety is not grown - Taubenhaus).

Yellows. Observed in New Jersey, Pennsylvania, and Maryland during August by J. L. Weimer.

Mosaic (undet.) New York. This is the first report of mosaic on alfalfa to the Plant Disease Survey. More work should be done with it to determine if it is transmissible.

Witches' broom (undet.) Reported from Idaho as causing a slender bushy growth of plants, found in a number of fields in Elmore County.

White spot. Reported from Mississippi. Truog (4) has reported that white spots around the border of older alfalfa leaves, and later in the center of the leaves are produced by lack of potash. Application of 300 to 500 pounds of potash fertilizer per acre is said to correct the condition. It is best applied just previous to sowing and should be worked into the soil thoroughly.

Recent literature:

1. Miller, J. H. Preliminary studies on Pleosphaerulina briosiana. Amer. Jour. Bot. 12: 224-237. April 1925.

2. Patvardhan, G. B. Some hosts of lucerne dodder (Cuscuta chinsisus). Poona Agr. Col. Mag. 17: 152-153. Dec. 1925.

3. Staker, Ernest V. The effect of dry heat on alfalfa seed and its adulterants. Jour. Amer. Soc. Agron. 17: 32-40. 1925.

4. Tehon, L. R., and E. Daniels. A note on the brown leaf-spot of alfalfa. Phytopath. 15: 714-719. Nov. 1925.
Macrosporium sarcinaeforme (Thyrospora sarcinaeforme)

5. Truog, Emil. Potash starvation symptoms in alfalfa and clover. Better Crops 5(2): 5-7, 35. Oct. 1925.

6. Weimer, J. L. Crown wart of alfalfa in Indiana. Phytopath. 15: 807. Dec. 1925.

CLOVER

Observations concerning the relative susceptibility of various strains of red clover to powdery mildew, anthracnose, root rot, and Macrosporium leaf-spot in Ohio were reported to the Survey in 1925 and have been published in the Plant Disease Reporter (9: 92-93. Oct. 1, 1925). Similar observations made in Delaware by J. F. Adams are given in table 91.

Table 91. Relative susceptibility of red clover strains to disease, as observed in Delaware, 1925.

Source of seed	Amount of infection		
	Powdery mildew (Erysiphe sp.)	Anthracnose (Gloeosporium caulivorum)	Leafspot (Macrosporium sarcinaeforme)
English	-	Very slight	-
Rumania	Very slight	Slight	Slight
Ohio	Abundant	Very slight	Very slight
Michigan	Medium	Slight	Very slight
Chilean	Very slight	Slight	-
Oregon	Medium	Medium	Very slight
French	-	Abundant	Very slight
Minnesota	Slight	Medium	Very slight
Italian	Slight	Medium	Very slight

"The variation in anthracnose prevalence may be associated with infestation carried by seed or because of greater susceptibility in this environment. Our local clover generally carries a medium amount of anthracnose and leafspot which is of greater prevalence with cool, rainy weather." (Adams)

ANTHRACNOSE CAUSED BY GLOEOSPORIUM CALIVORUM BERK. AND COLLETOTRICHUM TRIFOLII BAIN

New Jersey, Delaware, Mississippi, Texas, Ohio, Wisconsin, and Idaho reported on these diseases of red clover. In New Jersey and Wisconsin the disease was reported as that caused by Gloeosporium caulivorum while in the other states it was listed under the heading Colletotrichum trifolii. Since the symptoms of these two anthracnoses are practically the same diagnosis by macroscopical characters alone is not possible, and it is likely that many incorrect determinations of these diseases have been made. Monteith (1) has compared the two fungi with respect to temperature relations and growth in culture.

Reference:

1. Monteith, John Jr. Colletotrichum trifolii and Gloeosporium caulivorum on clover. (Abstract) Phytopath. 16: 71-72. Jan. 1925.

POWDERY MILDEW CAUSED BY ERYSIPHE POLYGONI DC.

Powdery mildew again was widespread over the country, 1925 being the fifth successive year that the disease has been prevalent in abundance on red clover. The noteworthy feature of this year's occurrence was the increased amount reported from the Pacific Northwest and from Montana. This same form of the mildew was reported from all of these states for the first time in 1924, and in all of them it was said to be much more prevalent this year than then. It was reported for the first time in western Washington this season, it being reported in 1924 from eastern Washington only. The facts that the disease appeared in the Pacific Northwest for the first time, in severe form, lastyear and that it increased considerably during 1925, tend to bear out the theory that this mildew is a new physiologic form which has been introduced into this country, spread rapidly through the eastern states, secured a foothold west of the Rocky Mountains and is now spreading in that region. All states have now reported the mildew as being present with the exception of Wyoming, Nevada, New Mexico, Arizona, and California. It would not be surprising to receive reports of its serious occurrence in some of these states within the next few years.

Collaborators' reports from the Northwest are as follows:

Montana: Has become abundant during the last month. (P. A. Young, Aug. 15)

Idaho: Increasing in importance from year to year. Very widespread; perithecia found only in the irrigated sections in the southern part of the state. (Hungerford)

Washington: Seen for first time this year in western part of state. On alsike, red, and white clovers. Perfect stage collected on alsike and white clovers. (Dept. Plant Path.

Oregon: Widespread, but amount of damage questionable. Practically every field observed white with it. Date of first appearance July 14. Some reports of control by application of sulfur dust. (Barss)

Dates of earliest appearance:

April 16	South Carolina	Clemson College	June 30	Delaware	Newark
May 3	Missouri	Columbia	July 8	Indiana	Lawrence Co.
May 15	New Jersey	Burlington Co.	July 14	Oregon	Corvallis
May 25	Minnesota	Ramsey Co.	July 22	New York	Otsego Co.
June 28	Massachusetts	Lee	Aug. 17	New Hampshire	Milton
June 30	Connecticut	Soundview			

When these dates are compared with those given for some of the other years it will be noted that many of them are comparatively late. The dry summer doubtless had its influence on this powdery mildew.

Table 92. Relative prevalence of powdery mildew of various strains of red clover in test plots at Pennsylvania Agricultural Experiment Station. Notes taken Oct. 5, 1924. (1)

Source of seed	Amount of mildew (per cent) Plat 1	Plat 2	Source of seed	Amount of mildew (per cent) Plat 1	Plat 2
Ohio	30	40	Roumania	5	Trace
Michigan	30	50	Roumania	Trace	Trace
Idaho	30	50	Hungary	Trace	Trace
Oregon	30	50	Finland	5	8
Oregon	30	50	Silesia	Trace	Trace
Canada	30	50	Italy	Trace	Trace
Canada	30	30	Italy	Trace	Trace
England	5	5	Italy	8	5
England	5	Trace	Chile	5	Trace
France	5	Trace	Chile	5	Trace
France	5	Trace			

Reference:

1. Noll, C. F., and C. J. Irwin. Red clover seed in Pennsylvania. Pennsylvania Agr. Exp. Sta. Bul. 200: 1-15. Jan. 1926.

RUSTS CAUSED BY UROMYCES SPP.

Uromyces sp. was reported occurring on clover species in Kentucky, New Jersey (first observed May 15, Mount Holly), and New Mexico (more than usual, trace loss).

Uromyces fallens (Desm.) Kern (reported also as U. trifolii (Hedw. f.) Lév.) was reported on red clover from Connecticut (average amount, 16

reports received), New York (common, trace of loss), Massachusetts (first noted April 19 at Amherst), Iowa (trace) and Minnesota (general, slight importance).

Uromyces trifolii (Hedw. f.) Lév. (reported also as U. hybridi Davis) was reported on alsike clover from Connecticut (average amount, fifteen reports received; first noted May 11 at Stratford), Massachusetts (collected April 28 at Amherst by W. H. Davis), Delaware (average amount, first noted May 13 at Georgetown), South Carolina (specimen collected at Calhoun, received from C. A. Ludwig May 26), and Washington (reported as U. fallens).

Uromyces trifolii (Hedw. f.) Lév. (reported also as U. trifolii-repentis (Cast.) Liro) on white clover collected at Amherst, Mass., by W. H. Davis, April 28; and reported from Connecticut where it was first observed May 11 at Stratford.

Uromyces elegans (Berk.) Lagh. A specimen of Carolina clover (Trifolium carolinianum) was collected by G. F. Weber in northern Florida, and a specimen from Thomas County, Georgia was received from O. C. Boyd, March 30. Concerning the occurrence in the latter state, Boyd reported that 50 per cent of the plants of this species were affected while a dozen clovers, as well as alfalfa, vetch, Melilotus, etc., were free.

ROOT ROT CAUSED BY SCLEROTINIA TRIFOLIORUM ERIKS.

A specimen of crimson clover affected with this fungus was received from F. P. McWhorter of Norfolk, Virginia, who collected it April 1. It was also reported from Washington and Oregon. In the latter state it occurs in the western part, no reports ever having been received from eastern Oregon. The moist winter weather in the western portion favors the production of apothecia and infection. The disease does not spread during the dry season.

Recent literature:

1. Esmarch, F. Das Auswintern des Klees durch Kleekrebs. (Winter injury to clover from canker.) Die Kranke Pflanze 2 (1): 3-6. 1925.
The winter injury referred to is that caused in the spring after mild winters by the fungus Sclerotinia trifoliorum.

2. Wadham, S. M. Observations on clover rot (Sclerotinia trifoliorum Eriks.). New Phytol. 24: 50-56. 1925.

NEMATODE, TYLENCHUS DIPSACI (KUHN) BASTIAN

This nematode has now been collected on red clover in Utah, Idaho, Washington, and Oregon. Collaborators in Idaho and Oregon reported it in 1925 but no reports of it were received by the Survey from the other two states.

Idaho: More important where it occurs in Twin Falls and Canyon Counties. (Hungerford)

Oregon: Has chiefly been found along the coast in Coos and Lane Counties. In 1924 it was found for the first time in Washington County. (McKay)

Reference:

1. Ware, M. W. A disease of wild white clover caused by the eelworm, Tylenchus dipsaci (Kuhn) Bastian. Ann. Appl. Biol. 12: 113-119. Feb. 1925.

MOSAIC (UNDET.)

New York, New Jersey, and Michigan report mosaic as occurring rather generally on red clover. From Virginia, specimens and reports of the disease on crimson clover were received from F. P. McWhorter of Norfolk. In Indiana it was reported by E. B. Mains as severe in the greenhouse on crimson clover and T. resupinatum, and also noted on T. arvensis and T. subterraneanum. In the variety plots at Lafayette it was observed June 5 on the red clover varieties Indiana, Canadian Lindsay, Idaho 2407, and Minnesota 2398.

OTHER DISEASES

Root rot of red clover caused by Fusarium sp. Reported from Idaho as not very important but causing some damage in isolated cases. In Kentucky Cooper (1) reported work done at the Experiment Station where Fusaria isolated from the roots of tobacco were capable of infecting red and alsike clover when inoculated into the roots of plants growing in artificial media.

Leafspot caused by Pseudopeziza trifolii (Biv.) Fckl. New York (common) and Idaho (of no importance).

Blight caused by Botrytis sp. reported on crimson clover from Delaware by J. F. Adams who observed it as early as May 13.

Bacterial blight caused by Bacterium trifoliorum Jones, Williamson, Wolf, & McC. reported from Indiana and Mississippi. E. B. Mains, reporting for Indiana, stated that it was serious in field plots of red clover at Lafayette, being first noted June 5. A field in Rush County was also heavily infected. In the varietal plots it was noted on the following red clovers: Canadian Ashawa, C. Huron Co., C. Welland, C. Altaswede, Indiana, Chilean C. R. T., Canadian Lindsay, Finnish 56870, English 2399E, Swiss 56896, Idaho 2407, New Zealand 56795, Oregon 23996, Minnesota 2398, Hungarian 56041, Michigan 2399A, German 2399L, Chilean 2394 and 2403, French 2401 and 2399H, Canadian Leamington, Bohemian 2307, Canadian Ex-drift, Latvian 55002, Italian 56880 and 2379.

Sooty spot caused by Phyllachora trifolii (Pers.) Fckl. Delaware (more than usual), Louisiana (about the same as usual, slight importance), and Minnesota (same as usual, negligible).

Leafspot caused by Macrosporium sp. Delaware (collected June 20 at Newark).

Recent literature:

1. Cooper, Thomas. Tobacco brown root-rot. In 37th annual Rept. Kentucky Agr. Exp. Sta. for the year 1924: 29-30. 1925.

2. Jaczewski, A. A. Gribnyia i bakterial 'nyia boliezni klevera. (Fungous and bacterial disease of clover.) Tula 1916: 1-64. 1916.

SWEET CLOVER

Stem spot caused by Mycosphaerella lethalis Stone. New York (found occurring generally in late autumn.)

Leafspot caused by Ascochyta sp. Specimen sent in from Somerset County, Pa. May 28; also reported from New Jersey and Manitoba, Canada.

Mosaic, undet. Found on both the yellow and white sweet clover, was reported occurring very commonly in New York state.

BUR CLOVER

Leafspot caused by Cercospora medicaginis Ell. & Ev. Specimen sent in from Thomas County, Georgia by O. C. Boyd, March 26.

Leafspot caused by Pseudoplea medicaginis Miles. A new disease of bur clover has been described by L. E. Miles (1). The fungus was collected near Auburn, Alabama. It is distinct from similar fungi occurring on alfalfa and clover. All species and varieties of bur clover were affected.

Recent literature:

1. Miles, L. E. A pyrenomycetous leaf spot of bur clover. Phytopath. 15: 677-690. Nov. 1925.
Pseudoplea medicaginis sp. nov.

COWPEA

WILT CAUSED BY FUSARIUM VASINFECTUM TRACHEIPHILUM EFS.

This disease was reported from South Carolina, Alabama, Mississippi,

Texas, Oklahoma, and Missouri. What was probably the same disease was reported from Illinois and California. In South Carolina it was said to be important locally; in Oklahoma, it was more or less prevalent in various sections of the state, especially in the older fields of southeastern Oklahoma; in Illinois, the disease was very important in the southern counties; in Missouri, reports of the loss of two fields, one of six and the other of ten acres, were received; in California, the disease was very important and was worse than in 1924. In some regions it was the limiting factor in the production of the crop and is on the increase on old blackeye bean land. An estimated reduction in yield of 7 per cent was made for California.

BACTERIAL SPOT CAUSED BY BACTERIUM VIGNAE GARDNER & KENDRICK

Gardner and Kendrick (1) have reported further on the bacterial spot of cowpea and lima bean during the year. They first found the disease in 1919, and each year since that time it has been observed.

Indiana: Less than last year, probably a minor disease; first collected in Lawrence County, July 8. It has been found on 23 varieties of cowpea and none have proved resistant. It is also pathogenic to Vigna catjang, V. sesquipedalis, velvet bean, Adsuki bean, hyacinth bean, and tick trefoil. (Gardner)

Illinois: Apparently not very prevalent or serious, first observed July 22. (Tehon)

Reference:

1. Gardner, M. W., and James B. Kendrick. Bacterial spot of cowpea and lima bean. Jour. Agr. Res. 31: 841-863. Nov. 1, 1925.

LEAFSPOT CAUSED BY AMEROSPORIUM OECONOMICUM ELL. & TR.

Leafspot was reported from Delaware and Florida by J. F. Adams and G. F. Weber, respectively, and from Georgia, Alabama, and Mississippi by J. L. Weimer. No especial damage was reported although in Florida it was said to be of considerable importance.

OTHER DISEASES

Rootknot caused by Heterodera radicicola (Greef) Muell. South Carolina (unimportant), Missouri (five acres destroyed on one farm).

Mosaic (undet.) Reported by J. L. Weimer from Georgia and Mississippi, in each of which states a few plants were observed. E. C. Tims also reported it from Louisiana. These are the first reports to the Survey from these three states. Elmer (1), reporting on the transmissibility of

mosaic, succeeded in infecting cowpeas with mosaic from potato, eggplant, cucumber, and crook neck squash by transferring viriferous aphis or mealy bugs from the mosaic plants to the healthy cowpea. He was not able to infect cowpea with aphis which had been feeding on mosaic celery.

Leafspot caused by Cercospora cruenta Sacc. Reported from Delaware (less than usual), Florida (common and of importance because of defoliation), Georgia, Alabama, Texas, Indiana (noted on experimental plots), and Porto Rico (common, sometimes severe).

Leafspot caused by Cladosporium vignae Gardner. A new leafspot of cowpea has been reported during the year by M. W. Gardner (3) who found it occurring on the Early Buff variety on experimental test plots at Lafayette, Ind. The fungus is seed borne.

Powdery mildew caused by Erysiphe polygoni DC. Reported from Florida (on the host wherever it is grown, not important), and New Mexico (common, damage slight).

Stemrot caused by Corticium vagum Berk. & Curt. Reported from Florida by G. F. Weber who states that its occurrence was erratic, but that in several fields an average of 60 per cent loss was noted.

Gandrup (2) has recently reported a Rhizoctonia disease of Vigna oligosperma which is grown as a cover crop on rubber plantations in East Java, attacking the leaves and young twigs, causing them to drop off.

Leafspot caused by Cercospora vignae Racib. Reported by Cook from Porto Rico (not important).

Rust caused by Uromyces vignae Barclay. Texas.

Texas roctrot caused by Ozonium omnivorum Shear. Texas (less important than in 1924 on account of dry season).

Stemrot caused by Sclerotium rolfsii Sacc. Florida (occasional, not found in epidemic form).

Alternaria sp. Florida (common but not important).

Sunscald. Delaware (more).

Chlorosis caused by excess lime, not important, Texas.

Recent literature:

1. Elmer, O. H. Transmissibility and pathological effects of the mosaic disease. Iowa Agr. Exp. Sta. Res. Bul. 82: 39-91. 1925.

2. Gandrup, J. Over een Rhizoctonia-ziekte bij Vigna. Arch. Rubbercult. Nederl.-Ind. 9: 465-473. April 1925.

3. Gardner, Max W. Cladosporium spot of cowpea. Phytopath. 15: 453-462. 1925.

S O Y B E A N

Bacterial blight caused by Bacterium glycineum Coerper. J. L. Weimer, who examined fields in several of the southern states during 1925, collected this leafspot in South Carolina, Florida, Georgia, Alabama, Mississippi, and Louisiana. Considerable disease was noted in most of these places but

apparently it was not causing much damage. It was also reported by collaborators from Indiana and Illinois. In the latter state it was said to be serious wherever seen and was probably the most important disease of soybean.

Bacterial pustule caused by Bacterium phaseoli sojense Hedges. Reported from Delaware and the Arlington Experiment Farm, Virginia. At the Arlington Farm considerable differences in varietal susceptibility were noted.

Bacterial blight caused by Bacterium sojae Wolf. Louisiana.

Leafspot caused by Cercospora sp. A species of Cercospora, distinct from Cercospora cruenta, was reported from Louisiana by C. W. Edgerton on August 15 as follows:

> "A Cercospora leafspot appeared in some fields of soybeans in Louisiana in 1925. Spots were very abundant on the leaves, sometimes 100 to 200 on a single leaflet. Some fields were so badly affected that the fields had a yellowish cast. It evidently hindered the growth of the plants to a considerable extent. The variety Laredo was the most seriously affected. Some of the other varieties were hurt but little. This is the first year that this disease has been seen in Louisiana. It looks as if it might become an important disease in some varieties."

J. L. Weimer collected what may be the same disease in South Carolina, Mississippi, and Louisiana during August.

M. Miura (2) has described Cercospora daizu on soybean, the description of which closely resembles the one reported from Louisiana. This fungus has not been definitely reported from this country. Another Cercospora reported on in 1925 is C. kikuchii by Matsumoto and Tomoyasu (1).

Downy mildew caused by Peronospora sojae Wolf. Delaware (commonly found for first time in Sussex County on Wilson variety - Adams), Alabama, Mississippi, and Louisiana.

Stemrot caused by Sclerotium rolfsii Sacc. Observed by J. L. Weimer in South Carolina, Florida, Georgia, Alabama, and Mississippi; also reported by Tims from Louisiana. No particular damage was reported.

Leafspot caused by Septoria glycines Hemmi. What seems to be a new leafspot was reported again from Delaware (being more prevalent than last year - Adams).

Mosaic (undet.) Observed in Alabama and Mississippi by J. L. Weimer and reported from Louisiana and Indiana by collaborators. In the latter state according to Gardner, it was prevalent in the Midwest variety while symptoms were most severe in the Lexington variety.

A condition suggestive of mosaic but termed "chlorosis" was reported by Tehon of Illinois. It caused a white mottling of leaves in parts of Logan County.

An undetermined rootrot or wilt occurred in central Illinois, according to Tehon. The crown was rotted and the plant wilted and died. In a four-acre field in Cumberland County 9.8 per cent of the plants were dead.

Recent literature:

1. Matsumoto, T., and R. Tomoyasu. Studies on purple speck of soybean seed. Ann. Phytopath. Soc. Japan 1: 1-14. 1925.

2. Miura, M. Diseases of principal crops in Manchuria. Bul. So. Manchuria Railway Co., Koshurei; Agr. Exp. Sta. Manchuria 11: 1-56. 1921.

V E T C H

Leafspot caused by Ascochyta pisi Lib. Specimen sent in from Jefferson County, Kentucky by W. D. Valleau.

Stemrot caused by Sclerotinia trifoliorum Eriks. Reported from Oregon (less than last year, of very little importance).

Anthracnose caused by Colletotrichum sp. Louisiana (observed March 20).

Downy mildew caused by Peronospora viciae D By. Reported from Washington (first report to the Plant Disease Survey from that state).

Spot caused by Protocoronospora nigricans Atk. & Edg. Reported from the upper peninsula of Michigan, causing serious damage to the seed crop.

Rust caused by Uromyces porosus (Pk.) Jack. Washington on Vicia sp.

H O R S E B E A N

An item of some interest is the report of Miyaka (1) that Gibberella saubinetii (Mont.) Sacc. has been found in Japan causing a wilt of horse bean (Vicia faba var. equina).

Reference:

1. Miyaka, C. Gibberella saubinetii (Mont.) Sacc. as a causal fungus of the wilt-disease of horse-bean. Ber. Ohara Inst. Landw. Forsch. 2: 435-442. 1924.

K U D Z U

A bacterial leafspot (undet.) was reported by O. C. Boyd from Grady County, Georgia. Considering the general dryness of the season it developed considerably but was of very little economic importance. He first observed it August 27 at Cairo.

GRASSES

BROWN PATCH OF TURF ATTRIBUTED TO RHIZOCTONIA SOLANI KUEHN

There are two types of this disease, the large brown patch and the small brown patch. According to Monteith (6) the large type is generally limited to periods of hot, humid weather, while the small-spot type may occur over a much wider range of climatic conditions. Both types were reported from several of the eastern states in 1925. The small-spot form was the more common on the experimental plots at the Arlington Farm, Virginia. As will be seen from the following references considerable attention has been given this disease during the year from the control standpoint.

Recent literature:

1. Godfrey, G. H. Experiments on the control of brown-patch with chlorophenol mercury. Bul. Green Sect. U. S. Golf Assoc. 5: 83-87. April 1925.

2. ---------- Experiments on the control of brown-patch with chlorophenol mercury. Boyce-Thompson Inst. Plant Res. Prof. Paper 1: 1-5. 1925.

3. Monteith, J. Jr. July experiments for control of brown-patch on Arlington experimental turf garden. Bul. Green Sect. U. S. Golf Assoc. 5: 173-176. Aug. 15, 1925.

4. ---------- August experiments for control of brown-patch at Arlington experimental turf garden. Bul. Green Sect. U. S. Golf Assoc. 5: 202-203. Sept. 1925.

5. ---------- The season's experience with chlorophenol mercury as a control for brown-patch. Bul. Green Sect. U. S. Golf Assoc. 5: 272-273. Dec. 16, 1925.

6. ---------- Control of brown-patch in turf. (Abstract) Phytopath. 16: 76. Jan. 1926.

7. Oakley, R. A. Some things we have learned about brown-patch. Bul. Green Sect. U. S. Golf Assoc. 5: 75-77. April 1925.

8. Schardt, Al. Brown-patch control resulting from early-morning work on greens. Bul. Green Sect. U. S. Golf Assoc. 5: 254-255. Nov. 1925.

9. Tilford, P. E. Brown patch of lawnsand golf greens. Ohio Agr. Exp. Sta. Bimonth. Bul. 10: 185-187. Nov.-Dec. 1925.

OTHER DISEASES OF GRASSES

Bacterium andropogoni EFS.
Holcus sorghum sudanensis - Minnesota, New Mexico (reported as Bacillus sorghi)

Cladochytrium graminis Büsgen
Agrostis stolonifera - Connecticut (G. P. Clinton reported it injuring a golf green at Hartford, May 29; young seedlings of creeping bent injured most.)

Claviceps microcephala (Wallr.) Tul.
Agrostis palustris - Ohio.

Claviceps purpurea (Fr.) Tul.
Agropyron repens - Pennsylvania.
Bromus sp. - Washington.
Phalaris arundinacea - Pennsylvania.

Colletotrichum graminicolum (Ces.) Wils.
Agropyron repens - Pennsylvania.
Agrostis palustris - Pennsylvania.
Bromus secalinus - Pennsylvania.
Dactylis glomerata - Pennsylvania.
Poa pratensis - Pennsylvania.
Eleusine indica - Florida.

Ephelis mexicana Fr.
Cenchrus echinatus - Florida.

Erysiphe graminis DC.
Agropyron repens - Pennsylvania.
Poa pratensis - Massachusetts.

Helminthosporium sp.
Dactylis glomerata - Pennsylvania.

Helminthosporium ravenelli Curtis
Sporobolus berteroanus - Florida, Louisiana.

Helminthosporium vagans Drechsler
Poa pratensis - Pennsylvania.

Heterosporium phlei Gregory
Phleum pratense - New York.

Ophiobolus graminis Sacc.
Phleum pratense - New York.

Phyllachora graminis (Pers.) Fckl.
Agropyron repens - Pennsylvania.
Elymus sp. - Wyoming (Yellowstone Park).
Elymus condensatus - Wyoming (Yellowstone Park).
Muhlenbergia sp. - New Mexico.

Physarum cinereum (Myxomycete)
Capriola dactylon - Florida.

Piricularia grisea (Cke.) Sacc.
Syntherisma sanguinalis - New Jersey.

Puccinia clematidis (DC.) Lagh.
Agropyron repens - Pennsylvania.
Elymus condensatus - Washington.

Puccinia epiphylla Wetts.
Poa pratensis - Pennsylvania.

Puccinia hibisciata (Schw.) Kell.
Muhlenbergia sp. - New Mexico.

Puccinia coronata Cda.
Festuca elatior - Pennsylvania.
Notholcus lanatus - Washington.

Puccinia graminis Pers.
Agropyron repens - Pennsylvania.
Agrostis palustris - Connecticut, Pennsylvania.
Bromus secalinus - Pennsylvania.
Dactylis glomerata - Pennsylvania.
Festuca elatior - Pennsylvania.
Phleum pratense - Connecticut, New York, Pennsylvania, Iowa, Washington.
Poa compressa - Pennsylvania.

Rhynchosporium secalis (Oud.) Davis.
Bromus sp. - Oregon.
Dactylis glomerata - Oregon.
Danthonia sp. - Oregon.

Sclerospora graminicola (Sacc.) Schroet.
Chaetochloa magna - Florida (8).
Chaetochloa viridis - Iowa, New Mexico.

Septoria bromi Sacc.
Elymus condensatus - Wyoming (Yellowstone Park).

Sorosporium syntherismae (Peck) Farl.
Panicum sp. - Ohio.

Tilletia guyotiana Hariot
Bromus hordeaceus - Idaho, Washington.

Tylenchus tumefaciens Cobb (unpublished)
Cynodon incompletus - Found in Office of Nematology on material from South Africa.

Urocystis sp. (Probably U. agropyri)
Elymus condensatus - Wyoming (Yellowstone Park).

Urocystis agropyri (Preuss) Schroet.
Agropyron repens - New York.

Ustilago bromivora (Tul.) Fisch.
Bromus tectorum - Washington.

Ustilago neglecta Niessl
Chaetochloa lutescens - Pennsylvania.

Ustilago striaeformis (West.) Niessl
Dactylis glomerata - Pennsylvania.
Phleum pratense - Massachusetts, New York, Pennsylvania.
Poa pratensis - Pennsylvania.

Mosaic (Undet.)
Achyrodes aureum - Iowa.

Miscellaneous references on diseases of grasses:

1. Anon. Stem eel-worm in Bradley grass. So. African Gard. 15: 35. Jan. 1925.

2. Monteith, John Jr. Leafspot of bluegrass. Bul. Green Sect. U. S. Golf Assoc. 5: 198-199. Sept. 1925.

3. ---------- Control of turf diseases with chemicals. Bul. Green Sect. U. S. Golf Assoc. 5: 219-223. Oct. 15, 1925.

4. ---------- Checking the growth of algae on greens. Bul. Green Sect. U. S. Golf Assoc. 5: 218. Oct. 15, 1925.

5. Nisikado, Y. and C. Miyake. Morphological and physiological studies on a new Helminthosporium found on Leptochloa chinensis Nees. Ber. Ohara Inst. Landw. Forsch. 2: 473-490. 1924.

6. ---------- Ueber ein neues Helminthosporium auf Panicum crus-galli L. Ber. Ohara Inst. Landw. Forsch. 2: 597-612. 1925.

7. Shepherd, E. F. S. Le "streak disease" des graminees a Maurice. Rev. Agr. Ile Maurice. July-Aug. 1925: 540-542.

8. Weston, W. H. Jr., and G. F. Weber. Downy mildew (Sclerospora graminicola (Sacc.) Schroet.) on the Everglade Millet (Chaetochloa magna (Griseb) Scribn.). (Abstract) Phytopath. 16: 71. Jan. 1926.

9. Zundel, George L. Notes on the Ustilagineae of Washington. Mycologia 18: 87-89. March-April 1926.